Exercise - I (Conceptual Questions) Build Up Your Understanding

DISTANCE & DISPLACEMENT

1. If displacement of a particle is zero, the distance covered :
(1) must be zero
(2) may or may not be zero
(3) cannot be zero
(4) depends upon the particle

2. If the distance covered is zero, the displacement :
(1) must be zero
(2) may or may not be zero
(3) cannot be zero
(4) depends upon the particle

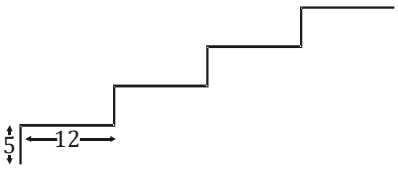
3. The location of a particle is changed. What can we say about the displacement and distance covered by the particle :
(1) Both cannot be zero
(2) One of the two may be zero
(3) Both must be zero
(4) If one is positive, the other is negative and vice-versa

4. The numerical ratio of distance to the displacement covered is always :–
(1) less than one
(2) equal to one
(3) equal to or less than one
(4) equal to or greater than one

5. Milkha Singh can cover one round of a circular park in 40 second, After 1 minute and 40 second, he will cover a distance and displacement respectively
(R = Radius of circle):-
(1) Zero, Zero (2) $4\pi R$, R
(3) $5\pi R$, 2R (4) $6\pi R$, 2R

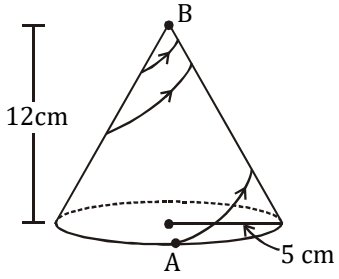
6. A hall has the dimensions 10 m × 10 m × 10 m. A fly starting at one corner ends up at a diagonally opposite corner. The magnitude of its displacement is nearly
(1) $5\sqrt{3}$ m (2) $10\sqrt{3}$ m
(3) $20\sqrt{3}$ m (4) $30\sqrt{3}$ m

7. An ant is scramping on the stairs as shown in the figure. There are '4' stairs and each stair has width of 12 cm and height of 5 cm. The distance travelled by the ant to scramp the stairs is :-



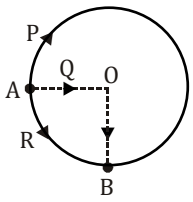
(1) 52 cm (2) 68 cm
(3) 48 cm (4) 20 cm

8. An insect starts climbing a conical birthday hat of radius 5 cm at base. It starts from point A and reaches point B, taking spiral path on the hat. Find out its displacement if height is 12 cm:-



(1) 12 cm (2) 8 cm
(3) 13 cm (4) 25 cm

9. Three particles P, Q and R are situated at point A on the circular path of radius 10 m. All three particles move along different paths and reach point B as shown in figure. Then the ratio of distance traversed by particles P and R is :



(1) $\frac{3}{4}$ (2) $\frac{3}{1}$ (3) $\frac{3\pi}{4}$ (4) $\frac{\pi}{3}$

10. A body moves along the curved path of a semi circle. Calculate the ratio of distance to displacement:
(1) 11 : 7 (2) 7 : 11
(3) 11 : $\sqrt{2} \times 7$ (4) 7 : $11\sqrt{2}$

11. Distance travelled by the tip of minute hand of length 10 cm in 100 sec is
(1) $\frac{\pi}{180}$m (2) $\frac{\pi}{360}$m
(3) $\frac{\pi}{1200}$m (4) $\frac{3\pi}{2160}$m

12. If a particle moves from point P(2, 3, 5) to point Q(3, 4, 5). Its displacement vector be :-
(1) $\hat{i} + \hat{j} + 10\hat{k}$ (2) $\hat{i} + \hat{j} + 5\hat{k}$
(3) $\hat{i} + \hat{j}$ (4) $2\hat{i} + 4\hat{j} + 6\hat{k}$

13. A man walks 30 m towards north, then 20 m towards east and the last $30\sqrt{2}$ m towards south-east. The displacement from origin is :
(1) 10 m towards west
(2) 50 m towards east
(3) $60\sqrt{2}$ m towards north west
(4) $60\sqrt{2}$ m towards east north

14. A person walks 80 m east, then turns right through angle 143° walks further 50 m and stops. His position relative to the starting point is
(1) 50 m, 53° east of south
(2) 50 m, 53° south of east
(3) 30 m, 37° south of east
(4) 30 m, 53° south of east

15. A drunkard is walking along a straight road. He takes 5 steps forward and 3 steps backward, followed by 5 steps forward and 3 steps backward and so on. Each step is one meter long and takes one second. There is a pit on the road 13 meters away from the starting point. The drunkard will fall into the pit after :
(1) 29 s (2) 21 s (3) 37s (4) 31 s

SPEED & VELOCITY, AVERAGE SPEED & AVERAGE VELOCITY

16. A train covers the first half of the distance between two stations with a speed of 30 km/h and the other half with 70 km/h. Then its average speed is :
(1) 50 km/h (2) 48 km/h
(3) 42 km/h (4) 100 km/h

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17. Select the correct statements from the following.
S1 :Average velocity is path length divided by time interval.
S2. In general, average speed $\geq$ |average velocity|
S3. A particle moving in a given direction with a non-zero velocity can have zero speed.
S4. The magnitude of average velocity is the average speed.
(1) S_1 (2) S_2 (3) S_3 (4) S_4

18. The magnitude of average velocity is equal to the average speed when a particle moves :
(1) on a curved path
(2) in the same direction
(3) with constant acceleration
(4) with constant retardation

19. A man walks for some time 't' with velocity (v) due east. Then he walks for same time 't' with velocity (v) due north. The average speed of the man is :
(1) 2v (2) $\sqrt{2}$ v
(3) v (4) $\frac{v}{\sqrt{2}}$

20. A car travels a distance d on a straight road in two hours and then returns to the starting point in next three hours. Its average speed and average velocity is :
(1) $\frac{d}{5}$, 0 (2) $\frac{2d}{5}$, 0
(3) $\frac{5d}{6}$, $\frac{d}{5}$ (4) none of these

21. A particle moves in the east direction with 15 m/sec for 2 sec then northwards with 5 m/s for 8 sec. Average velocity of the particle is :–
(1) 1 m/s (2) 5 m/s
(3) 7 m/s (4) 10 m/s

22. A man walks on an equilateral triangle along path ABC with constant speed then the ratio of average speed and magnitude of average velocity for A to C :-

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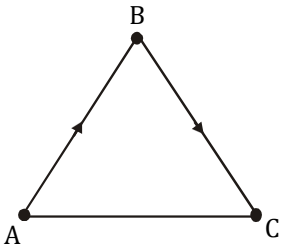

(1) 1 (2) 2 (3) $\frac{1}{2}$ (4) None

23. A car runs at constant speed on a circular track of radius 10 m taking 6.28s on each lap (i.e. round). The average speed and average velocity for half lap is :
(1) Velocity $20/\pi$ m/s, speed 10 m/s
(2) Velocity zero, speed 10 m/s
(3) Velocity zero, speed zero
(4) Velocity 10 m/s, speed zero

24. A particle moves in straight line in same direction for 20 sec. with velocity 3 m/s and then moves with velocity 4 m/s for another 20 sec. and finally moves with velocity 5 m/s for next 20 sec. What is the average velocity of the particle?
(1) 3 m/s (2) 4 m/s
(3) 5 m/s (4) Zero

25. An object travels 10 km at a speed of 100 m/s and another 10 km at 50 m/s. The average speed over the whole distance is :-
(1) 75 m/s (2) 55 m/s
(3) 66.7 m/s (4) 33.3 m/s

26. A body has speed V, 2V and 3V in first 1/3 part of total travelled distance S, second 1/3 part of S and third 1/3 part of S respectively. Its average speed will be :-
(1) V (2) 2V (3) $\frac{18}{11}$V (4) $\frac{11}{18}$V

27. A body covers one-third of the time with a velocity v_1 the second one-third of the time with a velocity v_2, and the last one-third of the time with a velocity v_3. The average velocity is :
(1) $\frac{v_1+v_2+v_3}{3}$ (2) $\frac{3v_1v_2v_3}{v_1v_2+v_2v_3+v_3v_1}$
(3) $\frac{v_1v_2+v_2v_3+v_3v_1}{3}$ (4) $\frac{v_1v_2v_3}{3}$

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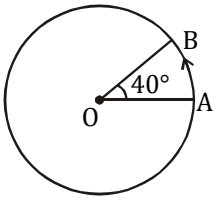
28. If a car cover 2/5th of total distance with v_1 speed and 3/5th distance with v_2 speed then the average speed is :-
(1) $\frac{1}{2}\sqrt{v_1v_2}$ (2) $\frac{v_1+v_2}{2}$
(3) $\frac{2v_1+v_2}{v_1+v_2}$ (4) $\frac{5v_1v_2}{3v_1+2v_2}$

29. A particle moving in a straight line covers half the distance with speed of 10 m/s. The other half of the distance is covered in two equal time intervals with speed of 4.5 m/s and 7.5 m/s respectively. The average speed of the particle during this motion is :
(1) 8.0 m/s (2) 12.0 m/s
(3) 10.0 m/s (4) 7.5 m/s

30. A point object traverses half the distance with velocity v_0. The remaining part of the distance is covered with velocity v_1 for the half time and with velocity v_2 for the rest half. The average velocity of the object for the whole journey is
(1) $2v_1(v_0+v_2)/(v_0+2v_1+2v_2)$
(2) $2v(v_0+v_1)/(v_0+v_1+v_2)$
(3) $2v_0(v_1+v_2)/(v_1+v_2+2v_0)$
(4) $2v_2(v_0+v_1)/(v_1+2v_2+v_0)$

31. A scooter going due east at 10 ms^{-1} turns in right side through an angle of 90°. If the speed of the scooter remains unchanged in taking this turn, the change in the velocity of the scooter is :-
(1) 20.0 ms^{-1} in south-west direction
(2) Zero
(3) 10.0 ms^{-1} in south-east direction
(4) 14.14 ms^{-1} in south-west direction

32. A person is moving in a circle of radius r with constant speed V. The change in velocity in moving from A to B is



(1) 2V cos 40° (2) 2V sin 40°
(3) 2V cos 20° (4) 2V sin 20°

33. An insect crawls a distance of 4m along north in 10 s and then a distance of 3m along east in 5 s. The average velocity of the insect is :-

(1) $\frac{7}{15}$ m/s (2) $\frac{1}{5}$ m/s

(3) $\frac{1}{3}$ m/s (4) $\frac{4}{5}$ m/s

ACCELERATION, AVERAGE ACCELERATION & APPLICATION OF CALCULUS

34. The position x of a particle varies with time (t) as $x = at^2 - bt^3$. The velocity at time t of the particle will be equal to zero, where t is equal to :

(1) $\frac{2a}{3b}$ (2) $\frac{a}{b}$ (3) $\frac{a}{3b}$ (4) $\frac{a}{2b}$

35. If x denotes displacement in time t and x = a sint, then acceleration is :

(1) a cos t (2) – a cos t

(3) a sin t (4) –a sin t

36. The motion of a particle is described by the equation $x = a + bt^2$ where a = 15 cm and b = 3 cm/sec^2. Its acceleration at time 3 sec will be :-

(1) 36 cm/sec^2 (2) 18 cm/sec^2

(3) 6 cm/sec^2 (4) 32 cm/sec^2

37. Equation of displacement for a particle is $s = 3t^3 + 7t^2 + 14t + 8$ m. Its acceleration at time t = 2 sec is :-

(1) 10 m/s^2 (2) 16 m/s^2

(3) 25 m/s^2 (4) 50 m/s^2

38. A body is moving according to the equation $x = at^2 + bt - c$. Then its instantaneous speed is given by :–

(1) a + 2b + 3ct (2) $a + 2bt - 3ct^2$

(3) 2b – 6ct (4) 2at + b

39. The relation $t = \sqrt{x} + 3$ describes the position of a particle where x is in meters and t is in seconds. The acceleration of particle is :–

(1) 2 m/s^2 (2) 4 m/s^2

(3) 5 m/s^2 (4) zero

40. The displacement of a particle is given by $y = a + bt + ct^3$. The initial velocity and acceleration are respectively :

(1) b, 0 (2) –b, 2c

(3) b, 2c (4) 2c, – 4d

41. Equation of a particle moving along the x axis is $x = u(t - 2) + a(t - 2)^2$

(1) the initial velocity of the particle is u

(2) the acceleration of the particle is a

(3) the acceleration of the particle is 2a

(4) at t = 2 particle is not at origin

42. If for a particle position $x \propto t$ then :–

(1) velocity is constant

(2) acceleration is non zero

(3) acceleration is variable

(4) None of these

43. The velocity of a body depends on time according to the equation = 20 + 0.1t. The body has :

(1) uniform acceleration

(2) uniform retardation

(3) non-uniform acceleration

(4) zero acceleration

44. Which of the following relations representing velocity of a particle describes motion with constant acceleration ?

(1) v = 6 – 7 t (2) $v = 3t^2 + 5t^3 + 7$

(3) $v = 9t^2 + 8$ (4) $v = 4t^{-2} + 3t^{-1}$

45. Which of the following equations represents the motion of a body moving with constant finite velocity? in these equations, y denotes the displacement in time t and p, q and r are arbitary constants :

(1) $y = (p + qt)^2 (r + pt)$

(2) y = p + tqr

(3) y = (p + t) (q + t) (r + 1)

(4) y = (p + qt)rt

46. The displacement of a particle starting from rest (at t=0) is given by $s = 6t^2 - t^3$

The time when the particle will attain zero acceleration is :

(1) 2s (2) 8s (3) 12s (4) 16s

47. The displacement of a particle varies with time according to the relation $x = \frac{k}{b}[1 - e^{-bt}]$.

Then the velocity of the particle is :

(1) $k(e^{-bt})$ (2) $\frac{k}{b^2 e^{-bt}}$

(3) kbe^{-bt} (4) None of these

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48. A particle moves along a straight line such that its displacement at any time t is given by $s = t^3 - 6t^2 + 3t + 4$ metres. The displacement when the acceleration is zero is :
(1) 3 m (2) –12 (3) 42 m (4) –6 m

49. Displacement x of a particle is related to time t as $x = at + bt^2 - ct^3$ where a, b and c are constants. The velocity of the particle when its acceleration is zero is given by :-
(1) $a + \frac{b^2}{c}$ (2) $a + \frac{b^2}{2c}$
(3) $a + \frac{b^2}{3c}$ (4) $a + \frac{b^2}{4c}$

50. A particle moves along the curve $y = \frac{x^2}{2}$. Here x varies with time as $x = \frac{t^2}{2}$. Where x and y are measured in metre and t in second. At t = 2s, the velocity of the particle (in ms^{-1}) is :
(1) $2\hat{i} - 4\hat{j}$ (2) $2\hat{i} + 4\hat{j}$
(3) $4\hat{i} + 2\hat{j}$ (4) $4\hat{i} - 2\hat{j}$

51. The velocity-time relation of an electron starting from rest is given by u = kt, where $k = 2\ m/s^2$. The distance traversed in 4 sec is :
(1) 9m (2) 16 m (3) 27 m (4) 36 m

52. The initial velocity of a particle is u (at t = 0) and the acceleration is given by $f = at^2$. Which of the following relations is valid?
(1) $v = u + at^2$ (2) $v = u + \frac{at^2}{2}$
(3) $v = u + \frac{at^3}{3}$ (4) v = u + at

53. A particle is moving with a velocity of 10m/s towards east. After 20 s its velocity changes to 10m/s towards north. Its average acceleration is:-
(1) zero
(2) $\sqrt{2}\ m/s^2$ towards N-W
(3) $\frac{1}{\sqrt{2}}\ m/s^2$ towards N-E
(4) $\frac{1}{\sqrt{2}}\ m/s^2$ towards N-W

54. Starting from rest, the acceleration of a particle is $a = 2(t - 1) m/s^2$. The velocity of the particle at t = 5 s is :-
(1) 15 m/s (2) 25 m/s
(3) 5 m/s (4) None of these

55. If the velocity of a particle is $(10 + 2t^2)$ m/s, then the average acceleration of the particle between 2s and 5s is :-
(1) $2m/s^2$ (2) $4m/s^2$
(3) $12m/s^2$ (4) $14m/s^2$

56. If velocity of a particle is given by $v = (3t^2+2) m/s$, then average velocity in the interval $0 \le t \le 2$sec:-
(1) 6 m/s (2) 8 m/s
(3) 3 m/s (4) 4 m/s

57. A particle located at x = 0 at time t = 0, starts moving along the positive x–direction with a velocity 'v' which varies as $v = \alpha\sqrt{x}$, then velocity of particle varies with time as : (α is a constant)
(1) $v \propto t$ (2) $v \propto t^2$
(3) $v \propto \sqrt{t}$ (4) v = constant

58. If the velocity of a particle is given by $v = (180 - 16x)^{1/2}$ m/s, then its acceleration will be:-
(1) Zero (2) $8\ m/s^2$
(3) $-8\ m/s^2$ (4) $4\ m/s^2$

59. The acceleration of a particle moving in a straight line varies with its displacement as a = 2S + 1. Velocity of the particle is zero at zero displacement. The relation between velocity and displacement is :-
(1) v = S(S + 1) (2) $v = \sqrt{2S(S+1)}$
(3) $v = \sqrt{S(S+1)}$ (4) None of these

60. The position vector of a particle is given as $\vec{r} = \left(t^2 - 4t + 6\right)\hat{i} + \left(t^2\right)\hat{j}$. The time after which the velocity vector and acceleration vector becomes perpendicular to each other is equal to:-
(1) 1 sec. (2) 2 sec.
(3) 1.5 sec. (4) 5 sec.

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61. At any instant of time acceleration and velocity of a particle are given by $\vec{a}=\hat{i}+\hat{j}$ & $\vec{v}=6\hat{i}+8\hat{j}$, then rate of change of speed (component of acceleration along velocity) at the same instant will be:-

(1) $\frac{(3\hat{i}+4\hat{j})}{25}$ (2) $\frac{6\hat{i}+8\hat{j}}{25}$

(3) $\frac{7}{25}(3\hat{i}+8\hat{j})$ (4) $\frac{7}{25}(3\hat{i}+4\hat{j})$

CONSTANT ACCELERATION MOTION, FREE FALL

62. If a body starts from rest, the time in which it covers a particular displacement with uniform acceleration is :

(1) inversely proportional to the square root of the displacement
(2) inversely proportional to the displacement
(3) directly proportional to the displacement
(4) directly proportional to the square root of the displacement

63. A body at rest is imparted motion to move in a straight line. It is then obstructed by an opposite force, then:

(1) the body may necessarily change direction
(2) the body is sure to slow down
(3) the body will necessarily continue to move in the same direction at the same speed
(4) none of the above.

64. If a car at rest accelerates uniformly to a speed of 144 km/h in 40 seconds, it covers a distance of :

(1) 200 m (2) 800 m
(3) 1440 m (4) 2980 m

65. If a car at rest accelerates uniformly and attains a speed of 54 km/h in 10s, then it covers a distance of

(1) 75 m (2) 100 m
(3) 200 m (4) 400 m

66. If a train travelling at 72 km/h is to be brought to rest in a distance of 100 m, then its retardation should be :

(1) 20 m/s^2 (2) 2 m/s^2
(3) 10 m/s^2 (4) 1 m/s^2

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67. Initially a body is at rest. If its acceleration is 5ms^{-2} then the distance travelled in the 5th second is :–

(1) 86.6 m (2) 87.5 m
(3) 88 m (4) 22.5 m

68. A car starts from rest travelling with constant acceleration. If distance covered by it in 10th second of its journey is 19m, what will be the acceleration of car?

(1) 4 m/s^2 (2) 3 m/s^2
(3) 2 m/s^2 (4) 1 m/s^2

69. A car starts from rest and moves with constant acceleration. The ratio of the distance covered in the nth second to that covered in n seconds is :-

(1) $\frac{2}{n^2}-\frac{1}{n}$ (2) $\frac{2}{n^2}+\frac{1}{n}$

(3) $\frac{2}{n}-\frac{1}{n^2}$ (4) $\frac{2}{n}+\frac{1}{n^2}$

70. A body starts from rest. What is the ratio of the distance travelled by the body during the 4th and 5th second?

(1) $\frac{7}{5}$ (2) $\frac{5}{7}$ (3) $\frac{7}{9}$ (4) $\frac{3}{7}$

71. A car moving with a velocity of 10 m/s can be stopped by the application of a constant force F in a distance of 20m. If the velocity of the car is 40 m/s. It can be stopped by this force in :

(1) $\frac{20}{3}$ m (2) 320 m
(3) 60 m (4) 180 m

72. A car moving with a speed of 40 km/h can be stopped by applying brakes after at least 2m. If the same car is moving with a speed of 120 km/h., what is the minimum stopping distance?

(1) 2 m (2) 4 m (3) 6 m (4) 18 m

73. The velocity acquired by a body moving with uniform acceleration is 30 m/s in 2 seconds and 50 m/s in 4 seconds. The initial velocity is :

(1) zero (2) 2 m/s
(3) 4 m/s (4) 10 m/s

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74. A body starts from rest and with a uniform acceleration of 5 ms^{-2} for 5 seconds. During the next 10 seconds it moves with uniform velocity. The total distance travelled by the body is :–
(1) 100 m (2) 312.5 m
(3) 500 m (4) 625 m

75. The velocity of a particle moving with constant acceleration at an instant t_0 is 10 m/s. After 5 seconds of that instant the velocity of the particle is 20m/s. The velocity at 2 second before t_0 is :
(1) 8 m/s (2) 4 m/s
(3) 6 m/s (4) 7 m/s

76. A bullet moving with a velocity of 200 cm/s penetrates a wooden block and comes to rest after traversing 4 cm inside it. What velocity is needed for travelling distance of 9 cm in same block :-
(1) 100 cm/s (2) 136.2 cm/s
(3) 300 cm/s (4) 250 cm/s

77. Which of the following four statements is true?
(1) A body can have zero velocity and still be accelerated
(2) A body can have a constant velocity and still have a varying speed
(3) A body cannot have a constant speed if it has a varying velocity
(4) The direction of the velocity of a body cannot change when its acceleration is constant.

78. If an iron ball and a wooden ball of same radii are released from a height h in vacuum then time taken by both of them to reach ground will be :
(1) unequal (2) exactly equal
(3) roughly equal (4) zero

79. Three different objects of masses m_1, m_2 and m_3 are allowed to fall from rest and from the same point 'O' along three different frictionless paths. The speeds of the three objects on reaching the ground, will be in the ratio of :–
(1) $m_1 : m_2 : m_3$ (2) $m_1 : 2m_2 : 3m_3$
(3) 1 : 1 : 1 (4) $\frac{1}{m_1} : \frac{1}{m_2} : \frac{1}{m_3}$

80. A body dropped from a tower reaches the ground in 5s. The height of the tower is about :
(1) 80 m (2) 125 m (3) 160 m (4) 40 m

81. A stone falls freely such that the distance covered by it in the last second of its motion is equal to the distance covered by it in the first 3 seconds. It remained in air for :–
(1) 2 s (2) 3 s (3) 5 s (4) 6 s

82. A body dropped from the top of a tower covers 5x distance in the last second of its fall. The time of fall is if x is the distance covered in first second of its fall-
(1) 2 sec (2) 4 sec.
(3) 3 sec. (4) $\left(\frac{50}{7}\right)$ sec

83. An object is dropped vertically down on earth. The change in its speed after falling through a distance 2d from its highest point is
(1) mgd (2) $\sqrt{2gd}$
(3) $2\sqrt{gd}$ (4) $2\sqrt{\frac{mg}{d}}$

84. A bullet enters in a thick wooden wall with speed u. If the bullet penetrates a distance 's' into the wood then retardation of the bullet is :
(1) $\frac{u^2}{s}$ (2) $\frac{u^2}{2s}$
(3) $\frac{u^2}{4s}$ (4) $\frac{2u^2}{s}$

85. A body dropped from the top of a tower covers a distance 9x in the last second of its journey, where x is the distance covered in first second. How much time does it take to reach the ground?
(1) 3s (2) 4s (3) 5s (4) 6s

86. A stone is dropped into a well in which the level of water is h below the top of the well. If v is velocity of sound, the time T after which the splash is heard is given by.
(1) $T = \frac{2h}{v}$ (2) $T = \sqrt{\frac{2h}{g}} + \frac{h}{v}$
(3) $T = \sqrt{\frac{2h}{v}} + \frac{h}{g}$ (4) $T = \sqrt{\frac{h}{2g}} + \frac{2h}{v}$

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87. A body is released from the top of a tower of height H metres. It takes t time to reach the ground. Where is the body $\frac{t}{3}$ time after the release :

(1) At $\frac{H}{2}$ metres from ground

(2) At $\frac{H}{4}$ metres from ground

(3) At $\frac{8H}{9}$ metres from the ground

(4) At $\frac{H}{9}$ metres from the ground

88. A body falling from height 'h' takes t_1 time to reach the ground. The time taken to cover the first $\left(\frac{1}{4}\right)^{th}$ of the height is :

(1) $t_2 = \frac{t_1}{\sqrt{2}}$ (2) $t_1 = \frac{t_2}{\sqrt{2}}$

(3) $t_2 = \frac{t_1}{2}$ (4) None of these

89. A stone is dropped from a certain height which can reach the ground in 5 seconds. It is stopped after 3 seconds of its fall and is again released. The total time taken by the stone to reach the ground will be :

(1) 6 s (2) 6.5 s (3) 7 s (4) 7.5 s

90. A body released from a height falls freely towards earth. Another body is released from the same point exactly two second later. The separation between them two seconds after the release of the second body is :–

(1) 9.8 m (2) 49 m

(3) 58.8 m (4) 19.6 m

91. Two balls are dropped from different heights at different instants. Second ball is dropped 2 seconds after the first ball. If both balls reach the ground simultaneously after 5 seconds of dropping the first ball, then the difference between the initial heights of the two balls will be: ($g=9.8m/s^2$)

(1) 58.8 m (2) 78.4 m (3) 98.0 m (4) 117.6 m

92. A body is released from the top of a tower of height H m. After 2sec it is stopped and then instantaneously released. What will be its height from ground after next 2sec :-

(1) (H–5) m (2) (H–10) m

(3) (H–20)m (4) (H-40) m

93. The ratio of the distances traversed, in successive intervals of time by a body falling from rest, are

(1) 1 : 3 : 5 : 7 : 9 : .....

(2) 2 : 4 : 6 : 8 : 10 : .....

(3) 1 : 4 : 7 : 10 : 13 : .....

(4) None of these

94. A particle is dropped from a certain height. The time taken by it to fall through successive distances of 1 km each will be :

(1) all equal, being equal to $\sqrt{\frac{2}{g}}$ second.

(2) in the ratio of the square roots of the integers 1: $\sqrt{2}:\sqrt{3}$

(3) in the ratio of the difference in the square roots of the integers, i.e.,

$\sqrt{1},,(\sqrt{2}-\sqrt{1}),(\sqrt{3}-\sqrt{2}),(\sqrt{4}-\sqrt{3})$ .....

(4) in the ratio of the reciprocals of the square roots of the integers, ie., $\frac{1}{\sqrt{1}},\frac{1}{\sqrt{2}},\frac{1}{\sqrt{3}}$.....

95. Drops of water fall from the roof of a building 27m high at regular intervals of time. When the first drop reaches the ground, at the same instant fourth drop begins to fall. What are the distances of the second and third drops from the roof?

(1) 6 m and 12 m (2) 6 m and 3 m

(3) 12 m and 3 m (4) 8 m and 2 m

96. Water drops fall at regular intervals from a tap 6 m above the ground. The third drop is leaving the tap at the instant the first drop touches the ground. How far above the ground is the second drop at that instant?

(1) 1.25 m (2) 2.50 m

(3) 3.75 m (4) 4.5 m

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97. Four marbles are dropped from the top of a tower one after the other with an interval of one second. The first one reaches the ground after 4 seconds. When the first one reaches the ground the distances between the first and second, the second and third and the third and forth will be respectively :-
(1) 35 m, 25 m and 15 m
(2) 30 m, 20 m and 10 m
(3) 20 m, 10 m and 5 m
(4) 40 m, 30 m and 20 m

98. A particle is thrown vertically upward. Its velocity at half of the maximum height is 10m/s. The maximum height attained by it is ($g=10\ ms^{-2}$) :–
(1) 8m (2) 20m (3) 10m (4) 16m

99. A ball is thrown upward with a velocity of 50 m/s. It will reach the ground after :–
(1) 10 s (2) 20 s (3) 5 s (4) 40 s

100. Two bodies are thrown vertically upwards with their initial speeds in the ratio 2 : 3. The ratio of the maximum heights reached by them and the ratio of time taken by them to return back to the ground respectively are :-
(1) 4 : 9 and 2 : 3 (2) 2 : 3 and $\sqrt{2}:\sqrt{3}$
(3) $\sqrt{2}:\sqrt{3}$ and 4 : 9 (4) $\sqrt{2}:\sqrt{3}$ and 2 : 3

101. A particle is thrown from the ground upward with velocity 40 m/s. Calculate maximum height:-
(1) 40 m (2) 80 m (3) 160 m (4) 8 m

102. If a ball is thrown vertically upwards with 40 m/s. its velocity after three seconds will be :
(1) 10 m/s (2) 20 m/s
(3) 30 m/s (4) 40 m/s

103. When a ball is thrown vertically up with velocity v_0, it reaches a maximum height 'h'. If one wishes to double the maximum height then the ball should be thrown with velocity –
(1) $\sqrt{2}\,v_0$ (2) $3v_0$
(3) $9v_0$ (4) $3/2v_0$

104. With what speed should a body be thrown upwards so that the distances traversed in 7th second and 8th second are equal?
(1) 58.4 m/s (2) 49 m/s
(3) $\sqrt{98}$ m/s (4) 68.6 m/s

105. If a ball is thrown vertically upwards with speed u, the distance covered during the last 't' seconds of its ascent is :–
(1) ut (2) $\frac{1}{2}gt^2$
(3) $ut-\frac{1}{2}gt^2$ (4) $(u+gt)t$

106. A body thrown vertically upwards with an initial velocity u reaches maximum height in 6 seconds. The ratio of the distance travelled by the body in the first second and the seventh second is :-
(1) 1 : 1 (2) 11 : 1 (3) 1 : 2 (4) 5 : 3

107. A ball is thrown vertically upwards with velocity 600 m/s. Calculate distance travelled in last 2 sec of its upward motion :-
(1) 20 m (2) 30 m (3) 10 m (4) 25 m

108. A body is projected vertically up at t = 0 with a velocity of 98 m/s. Another body is projected from the same point with same velocity after 4 seconds. Both bodies will meet at t =
(1) 6 s (2) 8 s (3) 10 s (4) 12 s

109. A ball is thrown vertically upwards. The ball was observed at a height h twice with a time interval Δt. The initial velocity of the ball is
(1) $\sqrt{8gh+(g\Delta t)^2}$ (2) $\sqrt{2gh+\left(\frac{g\Delta t}{2}\right)^2}$
(3) $\sqrt{8gh+(2g\Delta t)^2}$ (4) $\sqrt{2gh}$

110. A ball is thrown vertically upwards. Assuming the air resistance to be constant and considerable :–
(1) the time of ascent $\geq$ the time of descent
(2) the time of ascent < the time of descent
(3) the time of ascent > the time of descent
(4) the time of ascent = the time of descent

111. A particle is thrown up vertically with a speed 'v_1', in air. It takes time t_1 in upward journey and t_2 ($> t_1$) in the downward journey and returns to the starting point with a speed v_2.Then:
(1) $v_1 = v_2$
(2) $v_1 < v_2$
(3) $v_1 > v_2$
(4) Data is insufficient

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112. A particle is thrown upwards from ground. It experiences a constant resistance force which produces a retardation of 2 m/s^2. The ratio of time of ascent to the time of descent is
(g = 10 m/s^2):-
(1) 1 (2) $\sqrt{\frac{2}{3}}$ (3) $\frac{2}{3}$ (4) $\sqrt{\frac{3}{2}}$

113. A stone is thrown straight upward with a speed of 20 m/sec from a tower 200 m high. The speed with which it strikes the ground is approximately
(g = 9.8 m/s^2)
(1) 60 m/sec (2) 65 m/sec
(3) 70 m/sec (4) 75 m/sec

114. A balloon is at a height of 81 m and is ascending upwards with a velocity of 12 m/s. A body of 2 kg weight is dropped from it. If g = 10 m/s^2, the body will reach the surface of the earth in:-
(1) 1.5 s (2) 4.025 s
(3) 5.4 s (4) 6.75 s

115. A ball is thrown vertically upwards from the top of a tower with velocity 4.9 ms^{-1}. It strikes the pond near the base of the tower after 3 seconds. The height of the tower is :-
(1) 73.5 m (2) 44.1 m
(3) 29.4 m (4) None of these

116. A stone is thrown upwards with a speed 'u' from the top of the tower reaches the ground with a velocity '3u'. The height of the tower is:-
(1) $\frac{3u^2}{g}$ (2) $\frac{4u^2}{g}$ (3) $\frac{6u^2}{g}$ (4) $\frac{9u^2}{g}$

117. A body dropped from a height h, strikes the ground with velocity 3 m/s. Another body of same mass is thrown downward from the height h with an initial velocity of 4 m/s. Find the final velocity with which it strikes the ground
(1) 3 m/s (2) 4 m/s
(3) 5 m/s (4) 12 m/s

118. From a building two balls A and B are thrown such that A is thrown upwards and B downwards (both vertically) with same speed. If V_A and V_B are their respective velocities on reaching the ground then :-
(1) $V_B > V_A$ (2) $V_A = V_B$
(3) $V_A > V_B$ (4) None of these

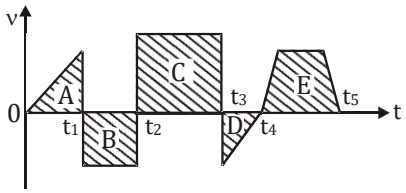
119. A stone falls from a balloon that is descending at a uniform rate of 10 ms^{-1}. The displacement of the stone from the point of release after 10 seconds is : (g = 10 m/s^2)
(1) 490 m (2) 510 m
(3) 600 m (4) 725 m

120. A parachutist after bailing out falls 50 m without friction. When parachute opens, it decelerates at 2 m/s^2. He reaches the ground with a speed of 3 m/s. At what approximate height, did he bail out?
(1) 293 m (2) 111 m
(3) 91 m (4) 182 m

121. A rocket is fired vertically from the ground. It moves upwards with a constant acceleration 20 m/s^2 for 30 sec after which the fuel is finished. After what time from the instant of firing the rocket will attain the maximum height? (Take g = 10 m/s^2)
(1) 90 s (2) 45 s (3) 60 s (4) 75 s

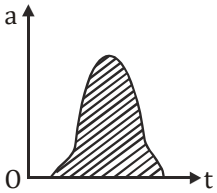
GRAPHICAL ANALYSIS

122. The velocity-time graph of an object is shown. The distance during the interval 0 to t_4 is :-



(1) Area A + Area B +Area C +Area D +Area E
(2) Area A + Area C – Area B – Area D
(3) Area A + Area B + Area C + Area D
(4) Area A + Area C + Area E –Area B +Area D

123. Figure below shows the acceleration-time graph of a one dimensional motion. Which of the following characteristics of the particle is represented by the shaded area?



(1) change in velocity
(2) change in position
(3) change in momentum
(4) velocity

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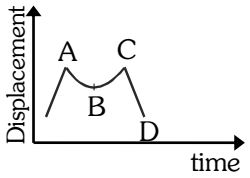
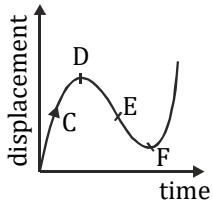
124. Fig. shows the displacement of a particle moving along x-axis as a function of time. The velocity of the particle is zero at :-



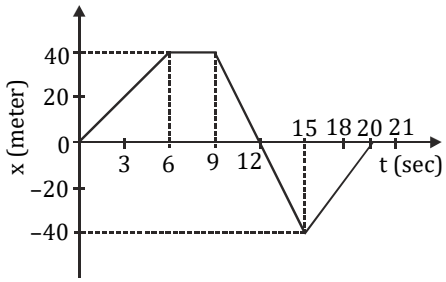
(1) A (2) B (3) C (4) D

125. The displacement-time graph of a moving particle is shown. The instantaneous velocity of the particle is positive at the point :



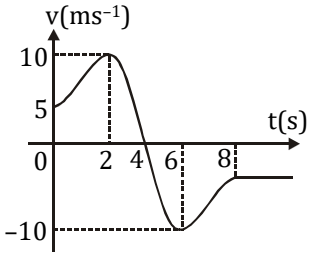
(1) D (2) F (3) C (4) E

126. A person walks along an east-west street and a graph of his displacement from home is shown in figure. His average speed for the whole time interval is



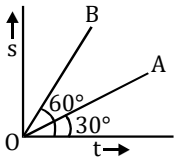
(1) 0 (2) 23 m/s
(3) 8 m/s (4) None of these

127. A particle is moving in a straight line y=3x. Its velocity time graph is shown in figure. Its speed is minimum at t =.....



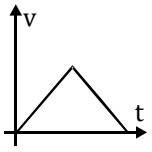
(1) 2s (2) 4s (3) 6s (4) 8s

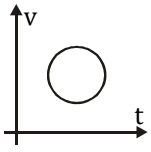
128. The displacement–time graph for two particles A and B are straight lines inclined at angles of 30° and 60° with the time axis. The ratio of velocity of particle A & B ($V_A : V_B$) is :-

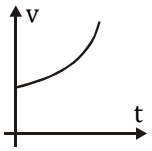


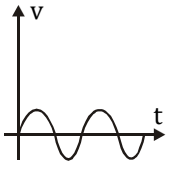
(1) 1 : 2 (2) 1 : $\sqrt{3}$
(3) $\sqrt{3}$: 1 (4) 1 : 3

129. Which one of the following curves do not represent motion in one dimension :-

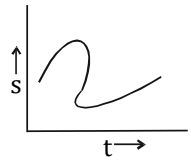
(1) 

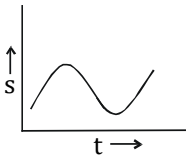
(2) 

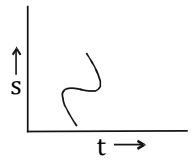
(3) 

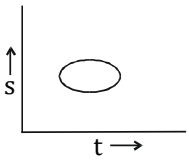
(4) 

130. Which of the following displacement–time graphs shows a realistic situation for a body in motion ?

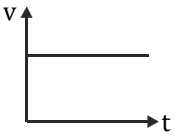
(1) 

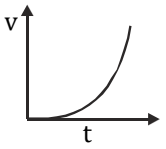
(2) 

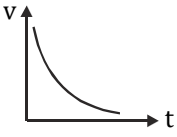
(3) 

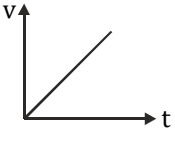
(4) 

131. Which of the following velocity-time graphs represent uniformly accelerated motion ?

(1) 

(2) 

(3) 

(4) 

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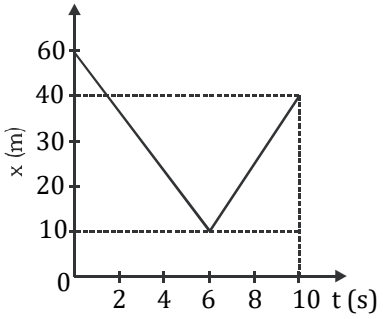
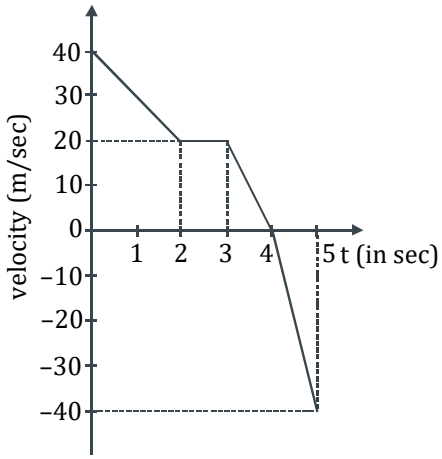
132. The fig. shows the position time graph of a particle moving on a straight line path. What is the magnitude of average speed of the particle over 10 seconds ?



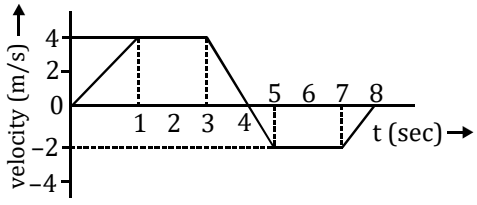
(1) 2 m/s (2) 4 m/s
(3) 6 m/s (4) 8 m/s

133. From the following velocity time graph of a body the distance travelled by the body and its displacement during 5 seconds in metres will be :



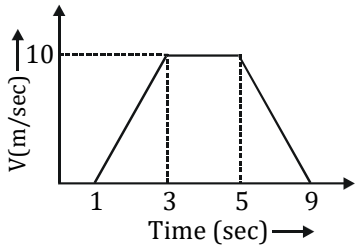
(1) 75, 75 (2) 110, 70
(3) 110, 110 (4) 110, 40

134. The v-t graph of linear motion of a particle starts its motion from origin is shown in adjoining figure. The distance of particle from origin after 8 sec. is :-



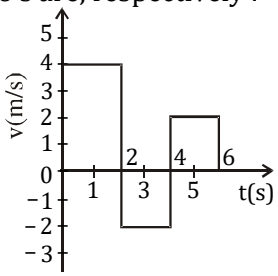
(1) 18 meters (2) 16 meters
(3) 8 meters (4) 6 meters

135. A particle moves according to given velocity–time graph. Then the ratio of distance travelled in last 4 seconds and 9 seconds is :-



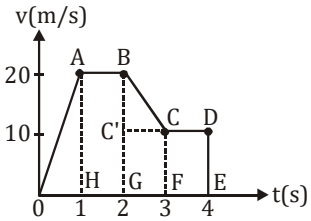
(1) $\frac{1}{4}$ (2) $\frac{2}{5}$ (3) $\frac{1}{8}$ (4) $\frac{4}{11}$

136. The velocity-time graph of a body moving in a straight line is shown in the figure. The displacement and distance travelled by the body in 6 s are, respectively :-



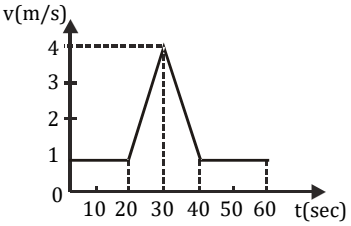
(1) 8 m, 16 m (2) 16 m, 8 m
(3) 16 m, 16 m (4) 8 m, 8m

137. The variation of velocity of a particle moving along a straight line is illustrated in the figure. The distance transvered by the particle in 3 seconds is



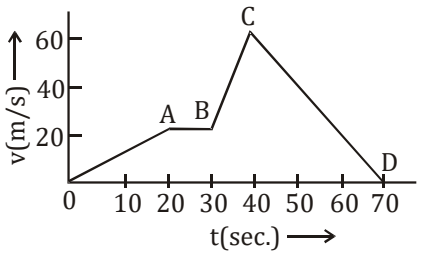
(1) 60 m (2) 45 m (3) 55 m (4) 30 m

138. Velocity-time (v-t) graph for a moving object is shown in the figure. Total displacement of the object during the time interval when there is zero acceleration is:–



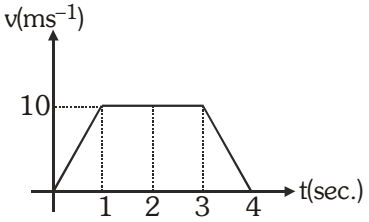
(1) 60 m (2) 50 m (3) 30 m (4) 40 m

139. The velocity versus time curve of a moving particle is as shown in the following figure. The maximum acceleration is



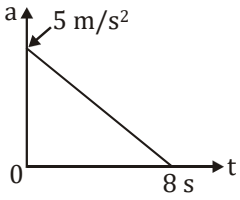
(1) 1 m sec^{-2} (2) 2 m sec^{-2}
(3) 3 m sec^{-2} (4) 4 m sec^{-2}

140. Find the average acceleration of the block from time t=2 sec to t=4 sec.



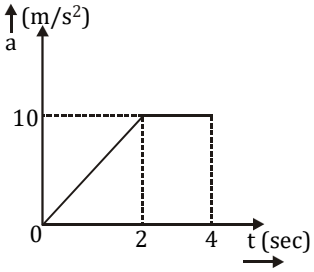
(1) 5 m/s^2 (2) 10 m/s^2
(3) –5 m/s^2 (4) –10 m/s^2

141. A particle starts from rest. Its acceleration at time t = 0 is 5 m/s^2 which varies with time as shown in the figure. The maximum speed of the particle will be :



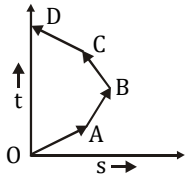
(1) 7.5 m/s (2) 15 m/s
(3) 20 m/s (4) 37.5 m/s

142. A particle starts from rest, its acceleration-time graph is shown in figure.



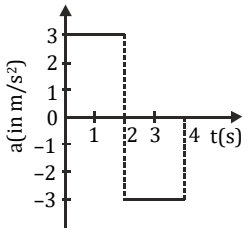
Find out velocity at t = 4 sec
(1) 20 m/s (2) 30 m/s
(3) 40 m/s (4) None of these

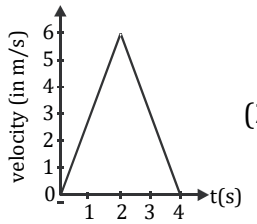
143. Which of the following options is correct for the object having a straight line motion represented by the following graph :-

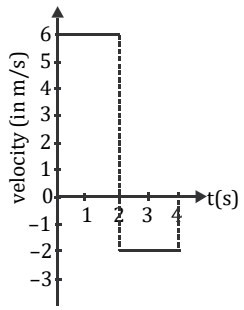


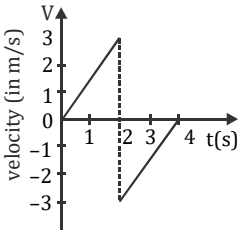
(1) The object moves with constantly increasing velocity from O to A and then it moves with constant velocity.
(2) Velocity of the object increases uniformly
(3) Average velocity is zero
(4) The graph shown is impossible

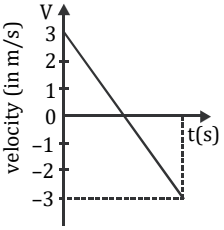
144. For the motion of a particle acceleration-time graph is shown in figure. The velocity time curve for the duration of 0 – 4 seconds is :



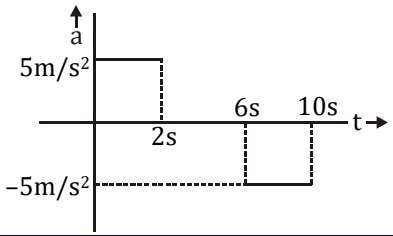
(1)


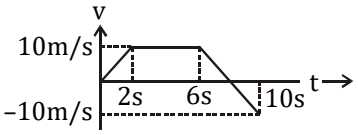
(2)


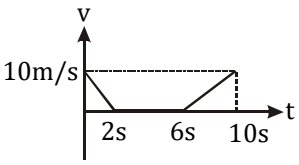
(3)


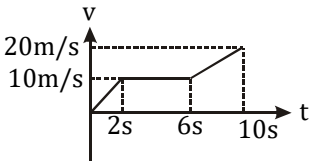
(4)


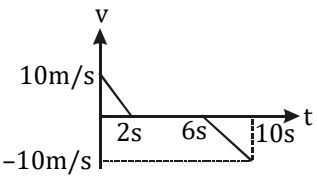
145. Acceleration-time graph of a body initially at rest is shown. The corresponding velocity-time graph of the same body is :-



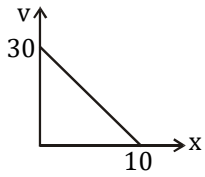
(1) 

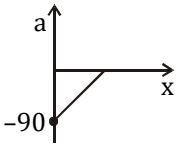
(2) 

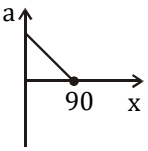
(3) 

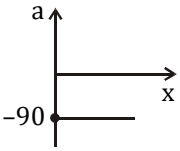
(4) 

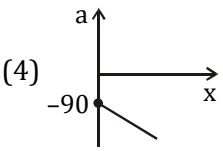
146. The given graph shows the variation of velocity with displacement. Which one of the graph given below correctly represents the variation of acceleration with displacement :-



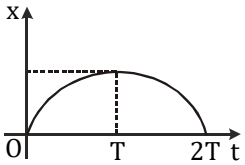
(1) 

(2) 

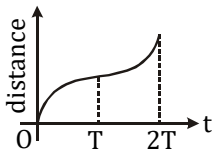
(3) 

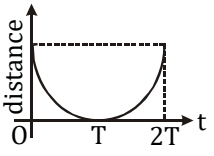
(4) 

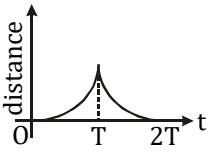
147. The x – t graph of a particle moving along a straight line is shown in figure.

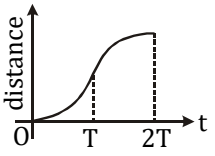


The distance-time graph of the particle is correctly shown by :

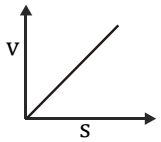
(1) 

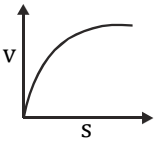
(2) 

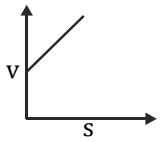
(3) 

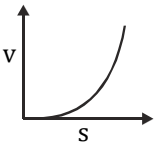
(4) 

148. A particle starts from rest and move with constant acceleration. Its velocity-displacement curve is :

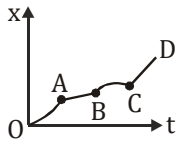
(1) 

(2) 

(3) 

(4) 

149. The graph between the displacement x and time t for a particle moving in a straight line is shown in figure. During the interval OA, AB, BC and CD, the acceleration of the particle is :

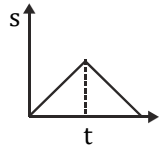


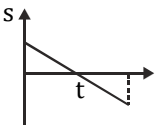
	OA	AB	BC	CD
(1)	+	0	+	+
(2)	–	0	+	0
(3)	+	0	–	0
(4)	–	0	–	0

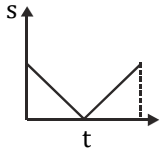
150. Acceleration-time curve for a body projected vertically upwards is a/an :–

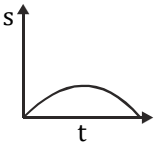
(1) Parabola (2) Ellipse
(3) Hyperbola (4) Straight line

151. A body is projected vertically upward from the surface of the earth, its displacement-time graph is :

(1) 

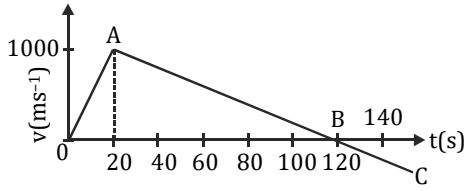
(2) 

(3) 

(4) 

TG: @Chalnaayaaar

152. A rocket is launched upward from the earth's surface whose velocity time graphs shown in figure. Then maximum height attained by the rocket is:



(1) 1 km (2) 10 km
(3) 100 km (4) 60 km

153. In above Q. no. 152, height covered by the rocket before retardation is :
(1) 1 km (2) 10 km
(3) 20 km (4) 60 km

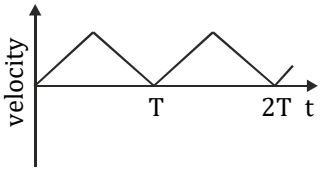
154. In above Q. no. 152, mean velocity of rocket during the time it took to attain the maximum height :
(1) 100 m/s (2) 50 m/s
(3) 500 m/s (4) 25/3 m/s

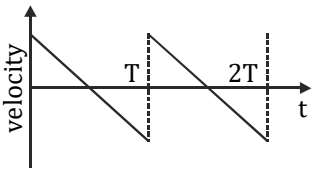
155. In above Q. no. 152, the retardation of rocket is:
(1) 50 m/s² (2) 100 m/s²
(3) 500 m/s² (4) 10 m/s²

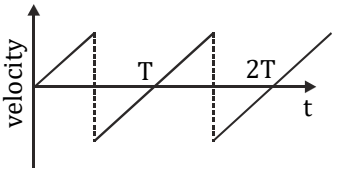
156. In above Q. no. 152, the acceleration of rocket is :
(1) 50 m/s² (2) 100 m/s²
(3) 10 m/s² (4) 1000 m/s²

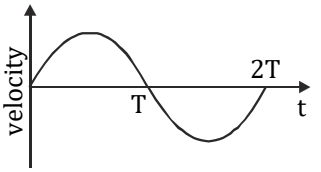
157. In above Q. no. 152, the rocket goes up and comes down on the following parts respectively :
(1) OA and AB (2) AB and BC
(3) OA and ABC (4) OAB and BC

158. A ball is dropped from the certain height on the surface of glass. It collides elastically and comes back to its initial position. If this process it repeated then the velocity time graph is :
(Take downward direction as positive)

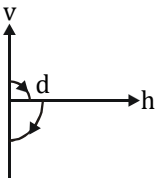
(1) 

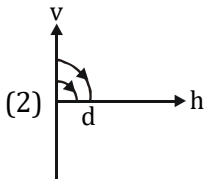
(2) 

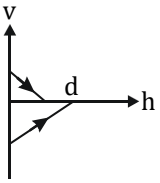
(3) 

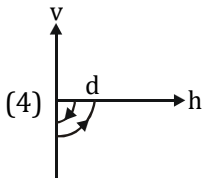
(4) 

159. A ball is dropped vertically from a height d above the ground. It hits the ground and bounces up vertically to a height d/2. Neglecting subsequent motion and air resistance, The graph according to which its velocity V varies with the height h above the ground is :-

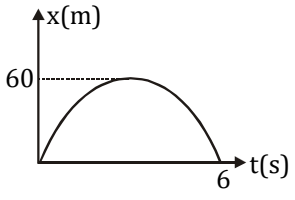
(1) 

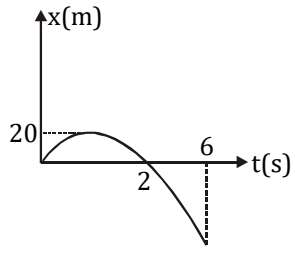
(2) 

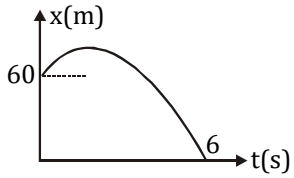
(3) 

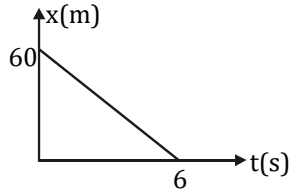
(4) 

160. A stone is thrown upwards from top of a tower 60 m high at a speed of 20 m/s. The correct position-time graph for the time interval in which it reaches ground, is (g = 10 m/s² & take origin at the base of the tower) :-

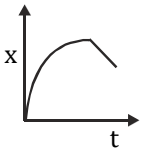
(1) 

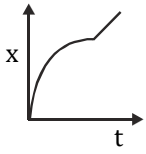
(2) 

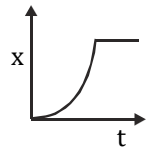
(3)


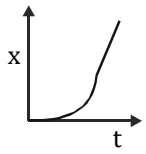
(4)


161. A car starts from rest and accelerates uniformly by for 4 seconds and then moves with uniform velocity which of the x-t graph represent the motion of the car ?

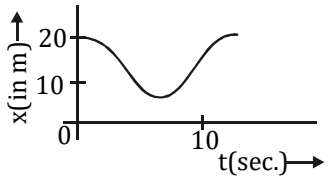
(1)


(2)


(3)


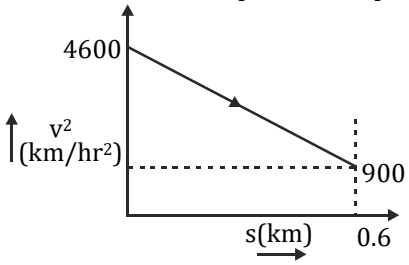
(4)


162. Figure shows x-t graph of a particle. Find the time t such that the average velocity of the particle during the period 0 to t is zero



(1) 6 sec. (2) 8 sec.
(3) 10 sec. (4) 12 sec.

163. Graph between the square of the velocity (v) of a particle and the distance (s) moved is shown in figure. The acceleration of the particle in kilometers per hour square is :



(1) 2250 (2) 3084
(3) – 2250 (4) – 3084

164. A train takes 4 min. to go between stations 2.25 km apart starting and finishing at rest. The acceleration is uniform for the first 40 sec and the deceleration is uniform for the last 20 sec. Assuming the velocity to be constant for the remaining time, then maximum speed of the train is :-

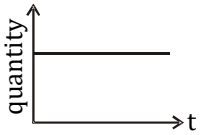
(1) 75 m/sec (2) 18.75 m/sec
(3) 37.5 m/sec (4) 10.7 m/sec

165. A car accelerates from rest at a constant rate of 2 m/s² for some time. Then, it retards at a constant rate of 4 m/s² and comes to rest. If it remains in motion for 3 seconds, then the maximum speed attained by the car is :

(1) 2 m/s (2) 3 m/s
(3) 4 m/s (4) 6 m/s

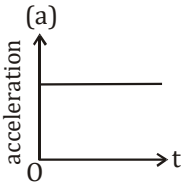
GROUND TO GROUND PROJECTION

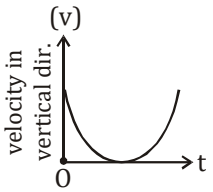
166. In the graph shown in fig. time is plotted along x-axis. Which quantity associated with a projectile motion is plotted along the y - axis ?

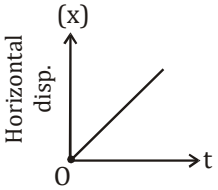


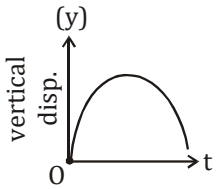
(1) kinetic energy (2) momentum
(3) horizontal velocity (4) none of the above

167. For ground to ground projection following curves are given :-

(a)


(b)


(c)


(d)


Find incorrect one.

(1) a (2) b
(3) c (4) d

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168. If air resistance is not considered in projectile motion, the horizontal motion takes place with
(1) constant velocity
(2) constant acceleration
(3) constant retardation
(4) variable velocity

169. In a projectile motion, the velocity :-
(1) is always perpendicular to the acceleration
(2) is never perpendicular to the acceleration
(3) is perpendicular to the acceleration for one instant only
(4) is perpendicular to the acceleration for two instants

170. In projectile motion, the modulus of rate of change of velocity–
(1) is constant
(2) first increases then decreases
(3) first decreases then increases
(4) None of the above

171. Which of the following quantities remains constant during projectile motion?
(A) Average velocity between two points.
(B) Average speed between two points
(C) $\frac{d\vec{v}}{dt}$
(D) $\frac{d^2}{dt^2}(\vec{v})$
(1) only A (2) only C
(3) A and C (4) C and D

172. A bomb is fired from a cannon with a velocity of 1000 m/s making an angle of 30° with the horizontal. What is the time taken by the bomb to reach at the highest point-
(1) 11 sec (2) 23 sec
(3) 38 sec (4) 50 sec

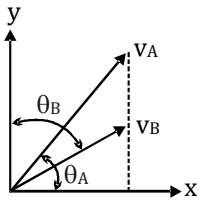
173. If time of flight of a projectile is 10 seconds. Range is 500 meters. The maximum height attained by it will be :-
(1) 125 m (2) 50 m
(3) 100 m (4) 150 m

174. A body is thrown with a velocity of 19.6 m/s making an angle of 30^0 with the horizontal. It will hit the ground after a time :–
(1) 3 s (2) 2 s (3) 1.5 s (4) 1 s

175. If a projectile is fired at an angle θ to the vertical with velocity u, then maximum height attained is given by :
(1) $\frac{u^2\cos\theta}{2g}$ (2) $\frac{u^2\sin^2\theta}{2g}$
(3) $\frac{u^2\sin^2\theta}{g}$ (4) $\frac{u^2\cos^2\theta}{2g}$

176. At the uppermost point of a projectile its velocity and acceleration are at an angle of :–
(1) 180° (2) 90° (3) 60° (4)45°

177. Two projectiles are projected with velocity v_A, v_B at angles θ_A (from horizontal) and θ_B (from vertical) as shown in the figure below, such that $v_A > v_B$ but having same horizontal component of velocity. Which of the following can not be correct ?



(1) $T_A > T_B$ (2) $H_A > H_B$
(3) $R_A > R_B$ (4) $R_B > R_A$

178. A player throws a ball that reaches to the another player in 4s. If the height of each player is 1.5m, the maximum height attained by the ball from the ground level is :
(1) 19.6 m (2) 21.1 m
(3) 23.6 m (4) 25.1 m

179. A body of mass m is thrown upwards at an angle θ with the horizontal with speed v. While rising up the magnitude of the velocity after t seconds will be:
(1) $\sqrt{(v\cos\theta)^2+(v\sin\theta)^2}$
(2) $\sqrt{(v\cos\theta-v\sin\theta)^2-gt}$
(3) $\sqrt{v^2+g^2t^2-(2v\sin\theta)gt}$
(4) $\sqrt{v^2+g^2t^2-(2v\cos\theta)gt}$

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180. A particle is fired with velocity u making θ angle with the horizontal. What is the magnitude of change in velocity when it returns to the ground.

(1) u cos θ (2) u

(3) 2u sin θ (4) (u cosθ – u)

181. In the above, the change in speed is :

(1) u cos θ (2) 0

(3) u sin θ (4) (u cosθ – u)

182. The angle which the velocity vector of a projectile, will make with the vertical after time t of its being thrown with a velocity v at an angle θ to the horizontal, is :

(1) θ (2) $\tan^{-1}\left(\frac{\theta}{t}\right)$

(3) $\tan^{-1}\left(\frac{v\cos\theta}{v\sin\theta - gt}\right)$ (4) $\tan^{-1}\left(\frac{v\sin\theta - gt}{v\cos\theta}\right)$

183. At a height 0.4 m from the ground, the velocity of a projectile in vector form is: $\vec{v} = (6\hat{i} + 2\hat{j})\,m/s$. The angle of projection from horizontal is (g = 10 m/s²) :-

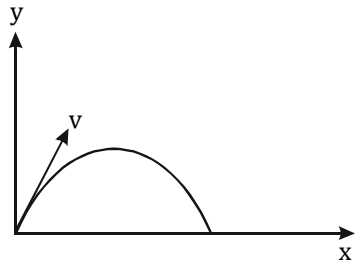
(1) 45° (2) 60°

(3) 30° (4) $\tan^{-1}(3/4)$

184. In case of a projectile fired at an angle 60° to the horizontal with velocity u, the horizontal range is:

(1) $\frac{u^2}{g}$ (2) $\frac{\sqrt{3}u^2}{2g}$ (3) $\frac{2u^2}{g}$ (4) $\frac{u^2}{g^2}$

185. If the instantaneous velocity of a particle projected as shown in figure is given by $\vec{v} = a\hat{i} + (b - ct)\hat{j}$ where a, b and c are positive constants, the range on the horizontal plane will be :



(1) 2ab/c (2) ab/c

(3) ac/b (4) a/2bc

186. A projectile is thrown from a point in a horizontal plane such that its horizontal and vertical velocity components are 9.8 m/s and 4.9 m/s respectively. Its horizontal range is :

(1) 4.9 m (2) 9.8 m

(3) 19.6 m (4) 39.2 m

187. A projectile is projected with initial velocity $(5\hat{i} + 12\hat{j})$ m/s. If g = 10 ms^{-2}, then horizontal range is :

(1) 4.8 metre (2) 9.6 metre

(3) 19.2 metre (4) 12 metre

188. A shell is fired vertically upwards with a velocity v_1 from the deck of a ship moving with a speed v_2. A person on the shore observes the motion of the shell as a parabola. Its horizontal range is given by :

(1) $\frac{2v_1^2v_2}{g}$ (2) $\frac{2v_1v_2^2}{g}$

(3) $\frac{2v_1v_2}{g}$ (4) $\frac{2v_1^2v_2^2}{g}$

189. The range of a projectile when fired at 60° to the horizontal is 0.5 km. What will be its range when fired at 45° with the same speed ?

(1) 0.5 km (2) $\frac{1.0}{\sqrt{3}}$ km

(3) 1.5 km (4) 2.0 km

190. The speed of a projectile at its maximum height is $\frac{1}{2}$ times of its inital speed 'u' of projection. Its range on the horizontal plane is :

(1) $\frac{\sqrt{3}u^2}{2g}$ (2) $\frac{u^2}{2g}$ (3) $\frac{3u^2}{2g}$ (4) $\frac{3u^2}{g}$

191. A bullet is fired from a cannon with velocity 500 m/s. If the angle of projection is 15° and g = 10m/s². Then the range is :-

(1) 25 × 10³ m (2) 12.5 × 10³ m

(3) 50 × 10² m (4) 25 × 10² m

192. For a given angle of projection if the initial velocity is tripled the range of the projectile becomes :-

(1) 9 times (2) one-fourth

(3) two times (4) four times

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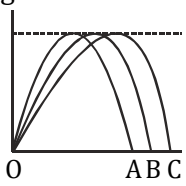
193. A ball is thrown at an angle θ to the vertical and the range is maximum. The value of tanθ is :
(1) 1 (2) $\sqrt{3}$
(3) $\frac{1}{\sqrt{3}}$ (4) 2

194. The maximum horizontal range of a gun is 25 km. If g = 10 m/s², the muzzle velocity of the shell must be :–
(1) 1600 m/s (2) 500 m/s
(3) $200\sqrt{2}$ m/s (4) $160\sqrt{10}$ m/s

195. A grasshopper can jump maximum distance 1.6 m. It spends negligible time on the ground. How far can it go in 10 seconds :-
(1) $5\sqrt{2}$m (2) $10\sqrt{2}$m
(3) $20\sqrt{2}$m (4) $40\sqrt{2}$m

196. Three projectiles A, B and C are thrown from the same point in the same plane. Their trajectories are shown in the figure. Which of the following statement is incorrect?



(1) The time of flight is the same for all the three
(2) The launch speed is same for all the three
(3) The horizontal velocity component is largest for particle C
(4) The maximum height is same for all the three

197. A projectile is thrown with an initial velocity of $\vec{v} = a\hat{i} + b\hat{j}$. If range of the projectile is four times the maximum height attained by it then :
(1) a = 2 b (2) b = a
(3) b = 2a (4) b = 4a

198. Two projectiles are fired from the same point with the same speeds at angles of projection 60° and 30° respectively. Which one of the following is true ?
(1) Their horizontal ranges will be the same
(2) Their maximum heights will be the same
(3) Their landing velocities will be the same
(4) Their times of flight will be the same

199. Three particles A, B and C are projectied from the same point with the same initial speeds making angles 30°, 45° and 60° respectively with the horizontal. Which of the following statements are correct ?
(1) A, B and C have unequal ranges
(2) Ranges of A and C are equal and less than that of B
(3) Ranges of A and C are equal and greater than that of B
(4) A, B and C have equal ranges

200. A number of bullets are fired in all possible directions with the same initial velocity u. The maximum area of ground covered by bullets is :–
(1) $\pi\left(\frac{2u^2}{g}\right)^2$ (2) $3\pi\left(\frac{u}{g}\right)^2$
(3) $5\pi\left(\frac{u}{2g}\right)^2$ (4) $\pi\left(\frac{u^2}{g}\right)^2$

201. Four bodies P, Q, R and S are projected with equal speed having angles of projection 15°, 30°, 45° and 60° with the horizontal respectively. The body having shortest range is :-
(1) P (2) Q (3) R (4) S

202. A boy can throw a stone up to a maximum height of 10 m. The maximum horizontal distance up to which the boy can throw the same stone will be :
(1) $20\sqrt{2}$m (2) 10 m (3) $10\sqrt{2}$m (4) 20 m

203. A cricketer can throw a ball to a maximum horizontal distance of 100m. How much high above the ground can the cricketer throw the same ball :-
(1) 200m (2) 400m (3) 100m (4) 50m

204. The maximum range of a projectile fired with some initial velocity is found to be 2000 m. The maximum height (H) reached by this projectile is:
(1) 250 metre (2) 500 metre
(3) 1000 metre (4) 2000 metre

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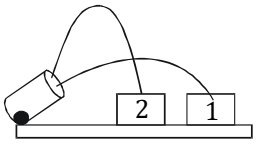
205. The cannon was set by mistake at 30° instead of 20° with the horizontal and was fired to hit the enemy target. The cannon-shell will now fall at :
(1) The enemy target
(2) Before the enemy target
(3) Beyond the enemy target
(4) May fall at any place

206. Two similar cannon simultaneously fires two identical cannon balls at target 1 and 2 as shown in the figure. If the cannon balls have identical initial speeds, which of the following statements is true?



(1) Target 2 is hit before target 1
(2) Target 1 is hit before target 2
(3) Both are hit at the same time
(4) information is insufficient

207. If R is the horizontal range of a particle projected at an angle 53° from horizontal, then the greatest height attained by it is :

(1) $\frac{R}{3}$ (2) $2R$

(3) $\frac{R}{2}$ (4) $\frac{R}{4}$

208. A projectile can have the same range R for two angles of projection. If h_1 and h_2 be the maximum height in the two cases, then :–

(1) $h_1h_2 \propto R^2$ (2) $h_1h_2 \propto R$

(3) $h_1h_2 \propto \frac{1}{R}$ (4) $h_1h_2 \propto \frac{1}{R^2}$

209. A body is thrown with some velocity from the ground. Maximum height attained when it is thrown at 37° to the horizontal is 90 m. What is the height attained when it is thrown at 53° to the horizontal?

(1) 90 m (2) 45 m
(3) 120 m (4) 160 m

210. Two stones are projected with the same speed but making different angles with the horizontal. Their ranges are equal. If the angle of projection of one is $\frac{\pi}{6}$ and its maximum height is y_1, then the maximum height of the other will be :

(1) $3y_1$ (2) $2y_1$ (3) $\frac{y_1}{2}$ (4) $\frac{y_1}{3}$

211. A ball is thrown at different angles with the same speed u and from the same point; it has the same range in both the cases. If y_1 and y_2 be the heights attained in the two cases, then $y_1 + y_2 = \ldots$:

(1) $\frac{u^2}{g}$ (2) $\frac{2u^2}{g}$ (3) $\frac{u^2}{2g}$ (4) $\frac{u^2}{4g}$

212. A body is projected at such an angle that the horizontal range is four times the greatest height. The angle of projection is :–

(1) 25° (2) 33° (3) 45° (4) 53°

213. The horizontal range of a projectile is $4\sqrt{3}$ times of its maximum height. Its angle of projection from horizontal will be:

(1) 45° (2) 60° (3) 90° (4) 30°

214. A projectile have range double as compare to its maximum height attained. The angle of projection from horizontal is–

(1) $\tan^{-1}$ (2) (2) $\tan^{-1}$ (4)
(3) $\tan^{-1}$ (3) (4) $\tan^{-1}$ (5)

215. The speed of a projectile at its maximum height is $\frac{\sqrt{3}}{2}$ times its initial speed. If the range of the projectile is 'P' times the maximum height attained by it, then P equals to -

(1) $\frac{4}{3}$ (2) $2\sqrt{3}$

(3) $4\sqrt{3}$ (4) $\frac{3}{4}$

216. A ball is projected to attain the maximum range. If the height attained is H, the range is

(1) H (2) 2H (3) 4H (4) H/2

217. The equation of a projectile is $y = x - \frac{gx^2}{2}$. The angle of projection is :
(1) 30° (2) 60°
(3) 45° (4) none

218. The equation of a projectile is $y = 4x - \frac{x^2}{4}$. The horizontal range is :
(1) 16 m (2) 8 m
(3) 64 m (4) 12.8 m

219. A particle is projected at an angle of 45° from horizontal, 6m away from the foot of a wall, just touches the top of the wall and falls on the ground on the opposite side at a distance 3m from it. The height of wall is :
(1) 2m (2) $\frac{4}{3}$m (3) $\frac{8}{3}$m (4) $\frac{3}{4}$m

220. A stone is projected from the ground with velocity 50 m/s at an angle of 30° from horizontal. It crosses a wall after 3 sec. How far beyond the wall the stone will strike the ground ($g = 10 m/sec^2$)
(1) 90.2 m (2) 89.6 m
(3) 86.6 m (4) 70.2 m

221. A shell fired from the ground is just able to cross the top of a wall 90m away and 45 m high moving horizontally. The direction of projection of the shell from horizontal will be :-
(1) 25° (2) 30° (3) 60° (4) 45°

222. An arrow is shot into the air. Its range is 100 metres and its time of flight is 5 s. If the value of g is assumed to be 10 m/s^2, then the horizontal component of the velocity of arrow is :
(1) 40 m/s (2) 20 m/s
(3) 31.25 m/s (4) 12.5 m/s

223. In the Q. 222, the maximum height attained by the arrow is :
(1) 25 m (2) 20 m/s
(3) 31.25 m (4) 12.5 m

224. In the Q. 222, the vertical component of the projection velocity is :
(1) 25 m/s (2) 40 m/s
(3) 12.5 m/s (4) 31.25 m/s

225. In the Q. 222, the angle of projection with the horizontal is :
(1) $\tan^{-1}\left(\frac{4}{5}\right)$ (2) $\tan^{-1}\left(\frac{5}{4}\right)$
(3) $\tan^{-1}\left(\frac{5}{8}\right)$ (4) $\tan^{-1}\left(\frac{8}{5}\right)$

226. A projectile is thrown into space so as to have the maximum possible horizontal range equal to 200m. Taking the point of projection as the origin, the coordinates of the point where the velocity of the projectile is minimum are:
(1) (200, 100) m (2) (50, 200) m
(3) (100, 50) m (4) (50, 100) m

227. If the range of a gun which fires a shell with muzzle speed v, is R, then the angle of elevation of the gun is :
(1) $\cos^{-1}\left(\frac{v^2}{Rg}\right)$ (2) $\cos^{-1}\left(\frac{Rg}{v^2}\right)$
(3) $\frac{1}{2}\sin^{-1}\left(\frac{v^2}{Rg}\right)$ (4) $\frac{1}{2}\sin^{-1}\left(\frac{Rg}{v^2}\right)$

228. Two balls A and B are thrown with speeds u and u/2 respectively. Both the balls cover the same horizontal distance before returning to the plane of projection. If the angle of projection of ball B is 30° with the horizontal, then the angle of projection of A is :
(1) $\sin^{-1}\left(\frac{1}{8}\right)$ (2) $\frac{1}{2}\sin^{-1}\left(\frac{\sqrt{3}}{8}\right)$
(3) $\frac{1}{3}\sin^{-1}\left(\frac{1}{8}\right)$ (4) $\frac{1}{4}\sin^{-1}\left(\frac{1}{8}\right)$

229. Two balls are projected from the same point on the ground simultaneously. First ball is projected vertically upwards and the second ball at an angle of projection 60° from the horizontal. Both the balls reach the ground simultaneously. The ratio of their velocities of projection are :
(1) 1 : 2 (2) 3 : 2 (3) $\sqrt{3}$: 2 (4) 2 : 3

230. A body is projected at an angle θ with horizontal, another body is projected with the same speed at an angle θ with the vertical then the ratio of the maximum height is :-
(1) 1 : 1 (2) $\tan^2\theta$: 1
(3) 1 : $\cot\theta$ (4) none of these

231. A ball is thrown from a point on earth surface with a speed v at an angle of projection θ from horizontal. From the same point and at the same instant a person starts running with a constant speed $\frac{v}{2}$ to catch the ball. The angle of projection of the ball from horizontal is :-
(1) 60° (2) 30° (3) 90° (4) 45°

232. For a projectile the ratio of maximum height reached to the square of flight time is (g=10 m/s²):-
(1) 5 : 4 (2) 5 : 2 (3) 5 : 1 (4) 10 : 1

233. At what angle to the horizontal should a ball be thrown so that its range R is related to the time of flight T as $R = 5\sqrt{3}T^2$? Take g = 10 ms^{-2} :
(1) 30° (2) 45° (3) 60° (4) 90°

234. A ball whose kinetic energy is E, is thrown at an angle of 60° to the horizontal. Its kinetic energy at the highest point of its flight will be :–
(1) $\frac{E}{4}$ (2) $\frac{E}{\sqrt{2}}$ (3) $\frac{E}{2}$ (4) zero

235. A cricket ball is hit at an angle of 30° with the vertical with kinetic energy K . The kinetic energy of the ball at the highest point of the path is :-
(1) Zero (2) K/4 (3) K/2 (4) 3K/4

236. A ball is projected vertically upwards with a certain speed. Another ball of the same mass is projected at an angle 30^0 to the vertical with the same initial speed. The ratio of their potential energies at highest points of their journey, will be
(1) 4 : 3 (2) 2 : 1 (3) 3 : 2 (4) 4 : 1

237. A particle is projected with a velocity u making an angle θ with the horizontal. At any instant, its velocity v is at right angle to its initial velocity u; then v is:
(1) u cos θ (2) u tan θ
(3) u cot θ (4) u sec θ

238. A force $\vec{F} = (6t^2\hat{i} + 4t\hat{j})N$ acts on a particle of mass 1 kg. What will be velocity of the particle at t = 3 second if at t = 0, the particle was at rest :-
(1) $(54\hat{i} + 12\hat{j})$ m/s (2) $(54\hat{i} + 18\hat{j})$ m/s
(3) $(12\hat{i} + 6\hat{j})$ m/s (4) none

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PROJECTION FROM A HEIGHT

239. A stone is projected horizontally with a speed 10 m/s from a 80 m high building. The distance of the target on the ground from the foot of the building is :- (g = 10 m/s²)
(1) 80 m (2) 40 m (3) 20 m (4) 10 m

240. An aeroplane moving horizontally with a speed of 90 km/h drops a food packet while flying at a height of 490 m. The horizontal range of the packet is :
(1) 180 m (2) 250 m
(3) 500 m (4) 670 m

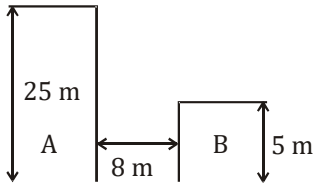
241. A stuntman plans to run along a roof top and then horizontally off it to land on the roof of next building. The roof of the next building is 19.6 metres below the first one and 6.2 metres away from it. What should be his minimum roof top speed in m/s, so that he can successfully make the jump ?
(1) 3.1 (2) 4.0 (3) 4.9 (4) 6.2

242. Two stones are projected horizontally from the same height with speeds 100 m/s and 40 m/s. The ratio of their horizontal range is :-
(1) 1 : 1 (2) 5 : 2 (3) 2 : 5 (4) 3 : 4

243. A body is thrown horizontally with a velocity 20 m/s from the top of a tower of height 20 m. It strikes the level ground through the foot of the tower at a distance x from the tower. The value of x is :-
(1) 20 m (2) 10 m (3) 40 m (4) 30 m

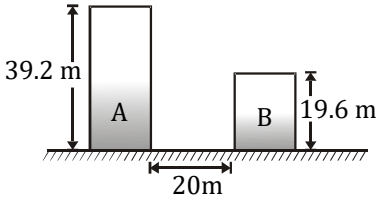
244. A bomber is flying horizontally with a constant speed of 150 m/s at a height of 19.6 m. The pilot has to drop a bomb at the enemy target. At what horizontal distance from the target should he release the bomb?
(1) 0 m (2) 300 m
(3) 600 m (4) 1000 m

245. A boy wants to jump from building A to building B. Height of building A is 25 m and that of building B is 5m. Distance between buildings is 8m. Assume that the boy jumps horizontally, then calculate minimum velocity with which he has to jump to land safely on building B.



(1) 6 m/s (2) 8 m/s
(3) 4 m/s (4) 2 m/s

246. A boy wants to jump from building A to building B. Height of building A is 39.2 m and building B is 19.6m. Distance between buildings is 20 m. Assuming boy jumps horizontally, then calculate minimum velocity with which boy has to jump to land safely on building B :-



(1) 10 m/s (2) 20 m/s
(3) 9.8 m/s (4) 19.6 m/s

247. Two buildings are separated by 30 m. By what speed a ball is projected horizontally from a window at height 150 m in one building so as to enter in the window at height 27.5 m in the other building.
(1) 2 m/s (2) 6 m/s (3) 4 m/s (4) 8 m/s

248. Two bodies of masses 100 kg and 50 kg are projected horizontally from same height with speeds 40 m/s and 20 m/s, simultaneously. The ratio of time taken by both the bodies to reach the ground is :-
(1) 1 : 1 (2) 1 : 2 (3) 2 : 1 (4) 1 : 4

249. A ball is thrown horizontally from a height of 90 m with a speed of 4.5 m/s then find the time when it is at the height of 45 m from the ground:
(1) $3\sqrt{2}$ sec (2) 10 sec (3) 9 sec (4) 3 sec

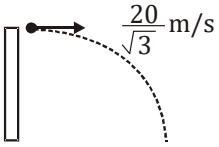
250. When a particle is thrown horizontally with speed u from top of tower, the displacement of the projectile at any time t is given by :
(1) $\sqrt{u^2t^2+g^2t^2}$ (2) $\sqrt{u^2t^2+\frac{1}{4}g^2t^4}$
(3) $\sqrt{u^2+g^2t^2}$ (4) $\sqrt{u^2-g^2t^2}$

TG: @Chalnaayaaar

251. A plane is flying horizontally at $98\sqrt{3}$ m/s and releases an object which reaches the ground in 10 s. The angle made by it with horizontal while hitting the ground is :
(1) 55° (2) 45° (3) 60° (4) 30°

252. From the top of a tower 78.4 m high, a ball is thrown horizontally. If the line joining the point of projection to the point where it hits the ground makes an angle of 45° with the horizontal, then the initial velocity of the ball is :
(1) 9.8 m/s (2) 4.9 m/s
(3) 19.6 m/s (4) 2.8 m/s

253. A particle is projected horizontally with a speed of $\frac{20}{\sqrt{3}}$ m/s, from some height at t = 0. At what time will its velocity make 30° angle with the initial velocity



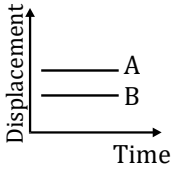
(1) 1 sec (2) 2 sec (3) 1.5 sec (4) 2/3 sec

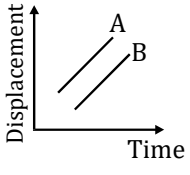
254. In the above question what will be the displacement of the particle in x-direction when its velocity makes 30° angle with the initial velocity
(1) $\frac{20}{\sqrt{3}}$ m (2) $\frac{40}{3\sqrt{3}}$ m (3) $\frac{50}{\sqrt{3}}$ m (4) $\frac{10}{\sqrt{3}}$ m

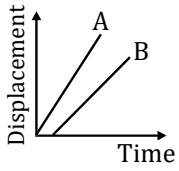
255. A ball is projected upwards from the top of a tower with a velocity of 50 m/s making an angle of 30^0 with the horizontal. The height of the tower is 70m. After how much time from the instant of throwing, will the ball reach the ground?
(1) 2 s (2) 5 s (3) 7 s (4) 9 s

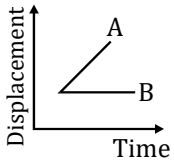
RELATIVE MOTION IN ONE DIMENSION

256. Which one of the following represents the displacement-time graph of two objects A and B moving with zero relative speed :-

(1) 

(2) 

(3) 

(4) 

257. A monkey is climbing up a tree at a speed of 3 m/s. A dog runs towards the tree with a speed of 4 m/s. What is the relative speed of the dog as seen by the monkey ?
(1) > 7 m/s
(2) Between 5 m/s and 7 m/s
(3) 5 m/s
(4) < 5 m/s

258. A train is moving towards east and a car is along north, both with same speed. The observed direction of car to the passenger in the train is:-
(1) East-north direction
(2) West-north direction
(3) South-east direction
(4) None of these

259. Two car A & B start from rest (from the same point) in same direction with acceleration 8 m/s^2 & 4 m/s^2 respectively then acceleration of car B in frame of A(Take direction of motion of car is positive) :-
(1) 4 m/s^2 (2) –4 m/s^2
(3) 12 m/s^2 (4) None of these

260. A motorcycle is moving with a velocity of 80 km/h and a car is moving with a velocity of 65 km/h in the opposite direction. What is the relative velocity of the motorcycle with respect to the car ?
(1) 15 km/h (2) 20 km/h
(3) 25 km/h (4) 145 km/h

261. Two cars A and B start moving from the same point with same speed v = 5 km/minute. Car A moves towards south and car B is moving towards west. What is the relative velocity of B with respect to A ?
(1) $5\sqrt{2}$ km/min towards South-East
(2) $5\sqrt{2}$ km/min towards North-West
(3) $5\sqrt{2}$ km/min towards South-West
(4) $5\sqrt{2}$ km/min towards North-East

262. A train is moving towards East with a speed 20 m/s. A person is running on the roof of the train with a speed 3 m/s in the direction of motion of train. Velocity of the person as seen by an observer on ground will be :
(1) 23 m/s towards East
(2) 17 m/s towards East
(3) 23 m/s towards West
(4) 17 m/s towards West

263. A jet air plane travelling with a speed of 500 km/h ejects its products of combustion with a speed of 1600 km/h relative to the jet plane. The speed of the latter with respect to an observer on the ground is :–
(1) 1600 km/h (2) 2100 km/h
(3) 1100 km/h (4) 500 km/h

264. A train moves in north direction with a speed of 54 km/h. A monkey is running on the roof of the train, against its motion with a velocity of 36 km/h. with respect to train. The velocity of monkey as observed by a man standing on the ground is:
(1) 5 m/s due north
(2) 25 m/s due south
(3) 10 m/s due south
(4) 10 m/s due north

265. A lift is moving upwards with acceleration a. A man in the lift drops a ball within the lift. The acceleration of the ball as observed by the man in the lift and a man standing stationary on the ground are respectively :
(1) g, g (2) g – a, g – a
(3) g + a, g (4) a, g

266. A stone is thrown upwards and it rises to a height of 200 m. The relative velocity of the stone with respect to the earth will be minimum at :–
(1) Height of 100 m (2) Height of 150 m
(3) Highest point (4) The ground

267. A 100 m long train crosses a man travelling at 5 km/h, in opposite direction in 6 seconds, then the velocity of train is :–
(1) 40 km/h (2) 55 km/h
(3) 20 km/h (4) 45 km/h

TG: @Chalnaayaaar

268. A 300 metres long train is moving due north with a speed of 20 m/s. A small bird is flying due south a little above the train with 5 m/s speed The time taken by the bird to cross the train is :-

(1) 6 s (2) 7 s (3) 9 s (4) 12 s

269. Two trains each 100 m long, are travelling in opposite directions with respective velocities 35 m/s and 15 m/s. The time of crossing is :–

(1) 2 s (2) 4 s

(3) $2\sqrt{3}$ s (4) $4\sqrt{3}$ s

270. A train 200 m long crosses a bridge 300 m long. It enters the bridge with a speed of 30 ms^{-1} and leaves it with a speed of 50 ms^{-1}. What is the time taken to cross the bridge ?

(1) 2.5s (2) 7.5s

(3) 12.5s (4) 15.0s

271. Two cars get closer by 8 m in every second while travelling in the opposite directions. They get closer by 0.8 m in every second while travelling in the same direction. What are the speeds of the two cars?

(1) 4 ms^{-1} and 4.4 ms^{-1}

(2) 4.4 ms^{-1} and 3.6 ms^{-1}

(3) 4 ms^{-1} and 3.6 ms^{-1}

(4) 4 ms^{-1} and 3 ms^{-1}

272. Velocity of a swimmer in still water is 5 m/s. If he takes 10 sec to swim upstream a distance of 30 m, then the speed of river is :-

(1) 3 m/s (2) 5 m/s

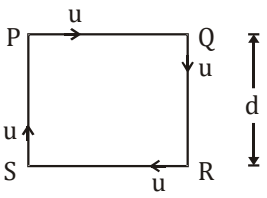
(3) 10 m/s (4) 2 m/s

273. Two cars are moving in the same direction with the same speed of 60 km/h. They are separated by 10 km. What is the speed of a car moving in the opposite direction if it meets the two cars at an interval of 5 minute?

(1) 45 km/h (2) 60 km/h

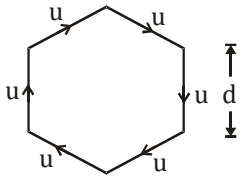
(3) 105 km/h (4) None

274. Four persons P, Q, R and S of same mass travel with same speed u along a square of side 'd' such that each one always faces the other. After what time will they meet each other?



(1) $\frac{d}{u}$ (2) $\frac{2d}{3u}$ (3) $\frac{2d}{u}$ (4) $d\sqrt{3}u$

275. Six persons of same mass travel with same speed u along a regular hexagon of side 'd' such that each one always faces the other. After how much time will they meet each other ?



(1) $\frac{d}{u}$ (2) $\frac{2d}{3u}$ (3) $\frac{2d}{u}$ (4) $d\sqrt{3}u$

276. A person walks up a stalled escalator in 45 sec. He is carried in 60s, when standing on the same escalator which is now moving. The time he would take to walk up the moving escalator will be :–

(1) 27 s (2) 72 s

(3) 18 s (4) 25.71 s

277. A bus starts from rest moving with an acceleration of $2m/s^2$. A cyclist, 96 m behind the bus starts simultaneously towards the bus at 20 m/s. After what time will he be able to overtake the bus :–

(1) 8 s (2) 10 s (3) 12 s (4) 1 s

278. A boat takes 2 hours to go 10 km and come back in still water lake. The time taken for going 10 km upstream and coming back with water velocity of 5 km/h is :

(1) 140 min (2) 150 min

(3) 160 min (4) 170 min

279. A river 2 km wide flows at the rate of 2km/h. A boatman who can row a boat at a speed of 6 km/h in still water, goes a distance of 2 km upstream and then comes back. The time taken by him to complete his journey is

(1) 60 min (2) 45 min

(3) 80 min (4) 90 min

TG: @Chalnaayaaar

280. Two bodies are held separated by 9.8 m vertically one above the other. They are released simultaneously to fall freely under gravity. After 2 s the relative distance between them is :-
(1) 4.9 m (2) 19.6 m
(3) 9.8 m (4) 39.2m

281. Two balls are thrown simultaneously, (A) vertically upwards with a speed of 20 m/s from the ground and (B) vertically downwards from a height of 80 m with the same speed and along the same line of motion. At which point will the balls collide? (take g = 10 m/s^2)
(1) 15 m above from the ground
(2) 15 m below from the top of the tower
(3) 20 m above from the ground
(4) 20 m below from the top of the tower

282. While sitting on a tree branch 20m above the ground, you drop a walnut. When the walnut has fallen 5m, you throws a second walnut straight down. What initial speed must you give the second walnut if they are both to reach the ground at the same time?
(g=10ms^{-2})
(1) 5 ms^{-1} (2) 10 ms^{-1}
(3) 15 ms^{-1} (4) None of these

283. A body A is thrown up vertically from the ground with velocity v_0 and another body B is simultaneously dropped from a height H. They meet at a height $\frac{H}{2}$ if v_0 is equal to
(1) $\sqrt{2gH}$ (2) $\sqrt{gH}$
(3) $\frac{1}{2}\sqrt{gH}$ (4) $\sqrt{\frac{2g}{H}}$

284. An elevator is accelerating upward at a rate of 6 ft/sec^2 when a bolt from its ceiling falls to the floor of the lift (Distance = 19 feet). The time (in seconds) taken by the falling bolt to hit the floor is (take g = 32 ft/ sec^2)
(1) $\sqrt{2}$ (2) 1
(3) $2\sqrt{2}$ (4) $\frac{1}{2\sqrt{2}}$

RELATIVE MOTION IN TWO DIMENSION

285. A boat is sent across a river with a velocity of 8km/hr. If the resultant velocity of boat is 10 km/hr, then velocity of the river is
(1) 10 km/hr (2) 8 km/hr
(3) 6 km/hr (4) 4 km/hr

286. A bird is flying towards south with a velocity 40km/h and a train is moving with a velocity 40 km/h towards east. What is the velocity of the bird w.r.t. an observer in the train ?
(1) $40\sqrt{2}$ km/h. N-E (2) $40\sqrt{2}$ km/h. S-E
(3) $40\sqrt{2}$ km/h. S-W (4) $40\sqrt{2}$ km/h. N-W

287. A bird is flying with a speed of 40 km/h in the north direction. A train is moving with a speed of 30 km/h in the west direction. A passenger sitting in the train will see the bird moving with velocity :
(1) 50 km/hr, 53° North of east
(2) 50 km/hr, 37° North of east
(3) 50 km/hr, 53° East of north
(4) 50 km/hr in North East direction

288. A boat is sailing with a velocity $(3\hat{i}+4\hat{j})$ with respect to ground and water in river is flowing with a velocity $(-6\hat{i}-8\hat{j})$. Relative velocity of the boat with respect to water is :
(1) $8\hat{j}$ (2) $9\hat{i}+12\hat{j}$
(3) $6\hat{i}+8\hat{j}$ (4) $-6\hat{i}-8\hat{j}$

289. Let $\vec{r}_1(t)=3t\hat{i}+4t^2\hat{j}$ and $\vec{r}_2(t)=4t^2\hat{i}+3t\hat{j}$ represent the positions of particles 1 and 2, respectively as functions of time t; $\vec{r}_1(t)$ and $\vec{r}_2(t)$ are in metres and t is in seconds. The relative speed of the two particles at the instant t = 2 sec, will be
(1) 1 m/s (2) $13\sqrt{2}$ m/s
(3) $5\sqrt{2}$ m/s (4) $7\sqrt{2}$ m/s

290. Rain is falling vertically with a speed of 3 m/s. If a man is running with the same speed then the velocity of rain w.r.t. man is :-
(1) 3 m/s (2) 6 m/s
(3) 4.2 m/s (4) 0 m/s

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291. A man is walking on a road with a velocity of 5km/h. When suddenly it starts raining, velocity of rain is 10km/h in vertically downward direction, relative velocity of the rain with respect to man is :

(1) $\sqrt{13}$ km/hr

(2) $\sqrt{7}$ km/hr

(3) $\sqrt{109}$ km/hr

(4) $5\sqrt{5}$ km/hr

292. If the rain is falling vertically downwards with velocity 20 m/s and if a bike is going with velocity 30 m/s. Calculate at what angle from the vertical a man on the bike must incline his umbrella so that he can save himself from rain :-

(1) $\tan^{-1}\left(\frac{2}{3}\right)$

(2) $\tan^{-1}\left(\frac{3}{2}\right)$

(3) $\tan^{-1}(1)$

(4) $\tan^{-1}\left(\frac{6}{5}\right)$

293. If rain is falling at some angle from vertical and has horizontal velocity 2 m/s in east direction. With what velocity a man must move on the horizontal surface so that rain will appear vertical to him :-

(1) 4 m/s in east direction

(2) 2 m/s in east direction

(3) 2 m/s in west direction

(4) 2 m/s in a circular path

294. A boy is running on a levelled road with velocity (u) with a long hollow tube in his hand. Water is falling vertically downwards with velocity (v). At what angle to the vertical, should he incline the tube so that the water drops enters without touching its side :

(1) $\tan^{-1}\left(\frac{v}{u}\right)$

(2) $\sin^{-1}\left(\frac{v}{u}\right)$

(3) $\tan^{-1}\left(\frac{u}{v}\right)$

(4) $\cos^{-1}\left(\frac{v}{u}\right)$

295. A river is flowing at the rate of 8 km/h. A swimmer swims across the river with a velocity of 10 km/h w.r.t. water. The resultant velocity of the man will be in (km/h):-

(1) $\sqrt{117}$ (2) $\sqrt{340}$

(3) $\sqrt{164}$ (4) $3\sqrt{40}$

296. A river is flowing from W to E with a speed of 5 m/min. A man can swim in still water with a velocity 10 m/min. In which direction should the man swim so as to take the shortest possible path to go to the north :-

(1) 30° with downstream

(2) 60° with downstream

(3) 120° with downstream

(4) South

297. A river 4.0 miles wide is flowing at the rate of 2 miles/hr. The minimum time taken by a boat to cross the river with a speed v = 2 miles/hr (in still water) is approximately

(1) 1 hr and 0 minute

(2) 2 hr

(3) 1 hr and 12 minutes

(4) 2 hr and 25 minutes

298. A river flows from east to west with a speed of 5m/min. A man on south bank of river, capable of swimming at the rate of 10 m/min in still water, wants to swim across the river in shortest time; he should swim :

(1) due north

(2) due north-east

(3) due north-east with double the speed of river

(4) none of the above

TG: @Chalnaayaaar

299. A boat-man can row a boat to make it move with a speed of 10 km/h in still water. River flows steadily at the rate of 6 km/h. and the width of the river is 4 km. If the boat man cross the river along the minimum distance of approach then time elapsed in rowing the boat will be :

(1) $\frac{2\sqrt{3}}{5}$ h (2) $\frac{2}{5\sqrt{3}}$ h

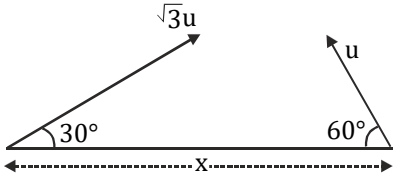
(3) $\frac{3\sqrt{2}}{5}$ h (4) $\frac{1}{2}$ h

300. A man wishes to swim across a river 0.5 km wide. If he can swim at the rate of $\sqrt{2}$ km/h in still water and the river flows at the rate of 1 km/h. The angle made by the direction (w.r.t. the flow of the river) along which he should swim so as to reach a point exactly opposite his starting point, should be :

(1) 60° (2) 120°

(3) 135° (4) 90°

301. Two particles are separated by a horizontal distance x as shown in figure. They are projected as shown in figure with different initial speeds. The time after which the horizontal distance between them becomes zero is :



(1) $\frac{x}{u}$

(2) $\frac{u}{2x}$

(3) $\frac{x}{2u}$

(4) none of these

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EXERCISE-I (Conceptual Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	2	1	1	4	3	2	2	3	2	1	1	3	2	1	3
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	3	2	2	3	2	2	2	1	2	3	3	1	4	4	3
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	4	4	3	1	4	3	4	4	1	1	3	1	1	1	2
Question	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	1	1	4	3	2	2	3	4	1	4	1	1	3	2	1
Question	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Answer	4	4	2	2	1	2	4	3	3	3	2	4	4	2	3
Question	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Answer	3	1	2	3	2	3	3	3	2	3	2	3	3	3	3
Question	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Answer	2	4	1	3	3	4	1	3	1	1	2	1	1	4	2
Question	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Answer	2	1	4	2	2	3	2	2	3	3	2	3	2	3	1
Question	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135
Answer	1	3	1	2	3	3	2	4	2	2	4	4	2	4	2
Question	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Answer	1	2	4	4	3	3	2	3	1	1	1	1	2	3	4
Question	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165
Answer	4	4	2	3	4	1	4	3	1	3	4	4	4	4	3
Question	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Answer	3	2	1	3	1	4	4	1	2	4	2	4	2	3	3
Question	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195
Answer	2	3	3	2	1	2	4	3	2	1	2	1	1	2	3
Question	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210
Answer	2	2	1	2	4	1	4	4	2	3	2	1	1	4	1
Question	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225
Answer	3	3	4	1	3	3	3	1	1	3	4	2	3	1	2
Question	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
Answer	3	4	2	3	2	1	1	1	1	2	1	3	2	2	2
Question	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255
Answer	1	2	3	2	3	1	2	1	4	2	4	3	4	2	3
Question	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270
Answer	2	3	2	2	4	2	1	3	1	3	3	2	4	2	3
Question	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285
Answer	2	4	2	1	3	4	1	3	2	3	3	3	2	2	3
Question	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
Answer	3	1	2	2	3	4	2	2	3	3	3	2	1	4	3
Question	301														
Answer	3														

TG: @Chalnaayaaar

Exercise - II (Previous Year Questions) AIPMT/NEET

AIPMT 2006

1. A car runs at a constant speed on a circular track of radius 100 m, taking 62.8 seconds for every circular lap. The average velocity and average speed for each circular lap respectively is :-
(1) 0,0 (2) 0, 10 m/s
(3) 10 m/s, 10 m/s (4) 10 m/s, 0

2. A particle moves along a straight line OX. At a time t (in seconds) the distance x (in metres) of the particle from O is given by $x = 40 + 12t - t^3$. How long would the particle travel before coming to rest ?
(1) 24 m (2) 40 m (3) 56 m (4) 16 m

3. Two bodies, A (of mass 1 kg) and B (of mass 3 kg), are dropped from heights of 16 m and 25 m respectively. The ratio of the time taken by them to reach the ground is :-
(1) $\frac{5}{4}$ (2) $\frac{12}{5}$ (3) $\frac{5}{12}$ (4) $\frac{4}{5}$

4. For angles of projection of a projectile $(45° - \theta)$ and $(45° + \theta)$, the horizontal ranges described by the projectile are in the ratio of :-
(1) 1 : 1 (2) 2 : 3 (3) 1 : 2 (4) 2 : 1

AIPMT 2007

5. A car moves from X to Y with a uniform speed v_u and returns to X with a uniform speed v_d. The average speed for this round trip is :-
(1) $\frac{v_u + v_d}{2}$ (2) $\frac{2v_d v_u}{v_d + v_u}$
(3) $\sqrt{v_u v_d}$ (4) $\frac{v_d v_u}{v_d + v_u}$

6. A particle moving along x-axis has acceleration f, at time t, given by $f = f_o\left(1 - \frac{t}{T}\right)$, where f_o and T are constants. The particle at t = 0 has zero velocity. At the instant when f = 0, the particle's velocity is :-
(1) $\frac{1}{2} f_o T$ (2) $f_o T$ (3) $\frac{1}{2} f_o T^2$ (4) $f_o T^2$

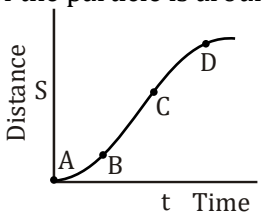
7. The position x of a particle with respect to time t along x-axis is given by $x = 9t^2 - t^3$ where x is in metres and t in seconds. What will be the position of this particle when it achieves maximum speed along the + x direction ?
(1) 24 m (2) 32 m (3) 54 m (4) 81 m

8. The distance travelled by a particle starting from rest and moving with an acceleration $\frac{4}{3}\text{m/s}^2$, in the third second is :-
(1) $\frac{10}{3}$m (2) $\frac{19}{3}$m (3) 6m (4) 4m

AIPMT 2008

9. A particle moves in a straight line with a constant acceleration. It changes its velocity from 10 m/s to 20 m/s while passing through a distance of 135 m in t seconds. The value of t is :-
(1) 12 (2) 9 (3) 10 (4) 1.8

10. A particle shows distance-time curve as given in this figure. The maximum instantaneous velocity of the particle is around the point :-



(1) D (2) A (3) B (4) C

11. A particle of mass m is projected with velocity v making an angle of 45° with the horizontal. When the particle lands on the ground level, the magnitude of the change in its momentum will be:-
(1) $mv\sqrt{2}$ (2) zero (3) 2 mv (4) $mv/\sqrt{2}$

AIPMT 2009

12. A body starting from rest is moving under a constant acceleration up to 20 sec. If it moves S_1 distance in first 10 sec., and S_2 distance in next 10 sec. then S_2 will be equal to :
(1) S_1 (2) $2S_1$ (3) $3S_1$ (4) $4S_1$

13. A bus is moving with a speed of 10 m/s on a straight road. A scooterist wishes to overtake the bus in 100 s. If the bus is at a distance of 1 km from the scooterist, with what speed should the scooterist chase the bus ?
(1) 10 m/s (2) 20 m/s
(3) 40 m/s (4) 25 m/s

TG: @Chalnaayaaar

TG: @Chalnaayaaar

AIPMT (Pre) 2010

14. A particle moves a distance x in time t according to equation $x = (t + 5)^{-1}$. The acceleration of particle is proportional to :-
(1) $(\text{velocity})^{2/3}$ (2) $(\text{velocity})^{3/2}$
(3) $(\text{distance})^{2}$ (4) $(\text{distance})^{-2}$

15. A ball is dropped from a high rise platform at t = 0 starting from rest. After 6 seconds another ball is thrown downwards from the same platform with a speed v. The two balls meet at t = 18s.What is the value of v ? (take g = 10 m/s^2)
(1) 60 m/s (2) 75 m/s
(3) 55 m/s (4) 40m/s

16. A particle has initial velocity $\left(3\hat{i}+4\hat{j}\right)$ and has acceleration $\left(0.4\hat{i}+0.3\hat{j}\right)$. Its speed after 10s is :-
(1) 10 units (2) 7 units
(3) $7\sqrt{2}$ units (4) 8.5 units

AIPMT (Mains) 2010

17. The speed of a projectile at its maximum height is half of its initial speed. The angle of projection is :-
(1) 15° (2) 30° (3) 45° (4) 60°

AIPMT (Pre) 2011

18. A boy standing at the top of a tower of 20 m height drops a stone. Assuming g = 10 m/s^2, the velocity with which it hits the ground is :-
(1) 10.0 m/s (2) 20.0 m/s
(3) 40.0 m/s (4) 5.0 m/s

19. A body is moving with velocity 30 m/s towards east. After 10 seconds its velocity becomes 40 m/s towards north. The average acceleration of the body is :-
(1) 1 m/s^2 (2) 7 m/s^2
(3) $\sqrt{7}$ m/s^2 (4) 5 m/s^2

20. A missile is fired for maximum range with an initial velocity of 20 m/s. If g = 10 m/s^2, the range of the missile is :-
(1) 40 m (2) 50 m
(3) 60 m (4) 20 m

TG: @Chalnaayaaar

AIPMT (Mains) 2011

21. A particle covers half of its total distance with speed v_1 and the rest half distance with speed v_2. Its average speed during the complete journey is:-
(1) $\frac{v_1+v_2}{2}$ (2) $\frac{v_1v_2}{v_1+v_2}$
(3) $\frac{2v_1v_2}{v_1+v_2}$ (4) $\frac{v_1^2v_2^2}{v_1^2+v_2^2}$

22. A projectile is fired at an angle of 45° with the horizontal. Elevation angle of the projectile at its highest point as seen from the point of projection, is :
(1) 45° (2) 60°
(3) $\tan^{-1}\frac{1}{2}$ (4) $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$

AIPMT (Pre) 2012

23. The motion of a particle along a straight line is described by equation $x = 8 + 12t - t^3$ where x is in metres and t in seconds. The retardation of the particle when its velocity becomes zero is :-
(1) 6 m/s^2 (2) 12 m/s^2
(3) 24 m/s^2 (4) zero

24. The horizontal range and the maximum height of a projectile are equal. The angle of projection of the projectile is :-
(1) $\theta = \tan^{-1}(2)$ (2) $\theta = 45°$
(3) $\theta = \tan^{-1}\left(\frac{1}{4}\right)$ (4) $\theta = \tan^{-1}(4)$

25. A particle has initial velocity $\left(2\hat{i}+3\hat{j}\right)$ and acceleration $\left(0.3\hat{i}+0.2\hat{j}\right)$. The magnitude of velocity after 10 seconds will be :
(1) 5 units (2) 9 units
(3) $9\sqrt{2}$ units (4) $5\sqrt{2}$ units

AIPMT (Mains) 2012

26. A stone is dropped from a height h. It hits the ground with a certain momentum P. If the same stone is dropped from a height 100% more than the previous height, the momentum when it hits the ground will change by :-
(1) 200 % (2) 100 % (3) 68% (4) 41%

NEET-UG 2013

27. A stone falls freely under gravity. It covers distances h_1, h_2 and h_3 in the first 5 seconds, the next 5 seconds and the next 5 seconds respectively. The relation between h_1, h_2 and h_3 is :-

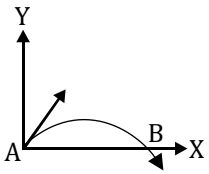
(1) $h_1 = h_2 = h_3$

(2) $h_1 = 2h_2 = 3h_3$

(3) $h_1 = \frac{h_2}{3} = \frac{h_3}{5}$

(4) $h_2 = 3h_1$ and $h_3 = 3h_2$

28. The velocity of a projectile at the initial point A is $(2\hat{i}+3\hat{j})$ m/s. Its velocity (in m/s) at point B is :-



(1) $2\hat{i}+3\hat{j}$ (2) $-2\hat{i}-3\hat{j}$

(3) $-2\hat{i}+3\hat{j}$ (4) $2\hat{i}-3\hat{j}$

AIPMT 2014

29. A projectile is fired from the surface of the earth with a velocity of 5 m/s and angle θ with the horizontal. Another projectile fired from another planet with a velocity of 3 m/s at the same angle follows a trajectory which is identical with the trajectory of the projectile fired from the earth. The value of the acceleration due to gravity on the planet is (in m/s^2) is: (given g = 9.8 m/s^2)

(1) 3.5 (2) 5.9

(3) 16.3 (4) 110.8

30. A particle is moving such that its position coordinates (x, y) are

(2m, 3m) at time t = 0

(6m, 7m) at time t = 2 s and

(13m, 14m) at time t = 5s.

Average velocity vector ($\vec{V}_{av}$) from t = 0 to t = 5 s is

(1) $\frac{1}{5}(13\hat{i}+14\hat{j})$ (2) $\frac{7}{3}(\hat{i}+\hat{j})$

(3) $2(\hat{i}+\hat{j})$ (4) $\frac{11}{5}(\hat{i}+\hat{j})$

AIPMT 2015

31. A particle of unit mass undergoes one-dimensional motion such that its velocity varies according to

$v(x) = \beta x^{-2n}$

where β and n are constants and x is the position of the particle. The acceleration of the particle as a function of x, is given by :

(1) $-2n\beta^2x^{-4n-1}$ (2) $-2\beta^2x^{-2n+1}$

(3) $-2n\beta^2e^{-4n+1}$ (4) $-2n\beta^2x^{-2n-1}$

32. A ship A is moving Westwards with a speed of 10 km/h and a ship B 100 km South of A, is moving Northwards with a speed of 10 km/h. The time after which the distance between them becomes shortest, is :-

(1) 5 h (2) $5\sqrt{2}$ h

(3) $10\sqrt{2}$ h (4) 0 h

Re-AIPMT 2015

33. Two particles A and B, move with constant velocities $\vec{v}_1$ and $\vec{v}_2$. At the initial moment their position vectors are $\vec{r}_1$ and $\vec{r}_2$ respectively. The condition for particle A and B for their collision is:-

(1) $\vec{r}_1-\vec{r}_2=\vec{v}_1-\vec{v}_2$ (2) $\frac{\vec{r}_1-\vec{r}_2}{|\vec{r}_1-\vec{r}_2|}=\frac{\vec{v}_2-\vec{v}_1}{|\vec{v}_2-\vec{v}_1|}$

(3) $\vec{r}_1\cdot\vec{v}_1=\vec{r}_2\cdot\vec{v}_2$ (4) $\vec{r}_1\times\vec{v}_1=\vec{r}_2\times\vec{v}_2$

NEET-I 2016

34. If the velocity of a particle is $v = At + Bt^2$, where A and B are constants, then the distance travelled by it between 1s and 2s is :-

(1) $\frac{3}{2}A+4B$ (2) 3A+7B

(3) $\frac{3}{2}A+\frac{7}{3}B$ (4) $\frac{A}{2}+\frac{B}{3}$

NEET-II 2016

35. Two cars P and Q start from a point at the same time in a straight line and their positions are represented by $x_P(t) = at + bt^2$ and $x_Q(t) = ft - t^2$. At what time do the cars have the same velocity?

(1) $\frac{a+f}{2(1+b)}$ (2) $\frac{f-a}{2(1+b)}$

(3) $\frac{a-f}{1+b}$ (4) $\frac{a+f}{2(b-1)}$

TG: @Chalnaayaaar

NEET(UG) 2017

36. Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time t_1. On other days, if she remains stationary on the moving escalator, then the escalator takes her up in time t_2. The time taken by her to walk up on the moving escalator will be

(1) $\frac{t_1t_2}{t_2-t_1}$ (2) $\frac{t_1t_2}{t_2+t_1}$

(3) $t_1 - t_2$ (4) $\frac{t_1+t_2}{2}$

37. The x and y coordinates of the particle at any time are $x = 5t - 2t^2$ and $y = 10t$ respectively, where x and y are in meters and t in seconds. The acceleration of the particle at t = 2s is :-

(1) 5 m/s² (2) – 4 m/s²

(3) – 8 m/s² (4) 0

NEET(UG) 2019

38. The speed of a swimmer in still water is 20 m/s. The speed of river water is 10 m/s and is flowing due east. If he is standing on the south bank and wishes to cross the river along the shortest path, the angle at which he should make his strokes w.r.t. north is given by :

(1) 30° west (2) 0°

(3) 60° west (4) 45° west

39. When an object is shot from the bottom of a long smooth inclined plane kept at an angle 60° with horizontal, it can travel a distance x_1 along the plane. But when the inclination is decreased to 30° and the same object the shot with the same velocity, it can travel x_2 distance. Then $x_1 : x_2$ will be

(1) $1:\sqrt{2}$ (2) $\sqrt{2}:1$

(3) $1:\sqrt{3}$ (4) $1:2\sqrt{3}$

NEET(UG) 2019 (Odisha)

40. A person standing on the floor of an elevator drops a coin. The coin reaches the floor in time t_1 if the elevator is at rest and in time t_2 if the elevator is moving uniformly. Then :-

(1) $t_1 < t_2$ or $t_1 > t_2$ depending upon whether the lift is going up or down

(2) $t_1 < t_2$

(3) $t_1 > t_2$

(4) $t_1 = t_2$

41. Two bullets are fired horizontally and simultaneously towards each other from roof tops of two buildings 100 m apart and of same height of 200m with the same velocity of 25 m/s. When and where will the two bullets collide. (g =10 m/s²)

(1) after 2s at a height 180 m

(2) after 2s at a height of 20 m

(3) after 4s at a height of 120 m

(4) they will not collide

42. A person travelling in a straight line moves with a constant velocity v_1 for certain distance 'x' and with a constant velocity v_2 for next equal distance. The average velocity v is given by the relation

(1) $\frac{1}{v}=\frac{1}{v_1}+\frac{1}{v_2}$ (2) $\frac{2}{v}=\frac{1}{v_1}+\frac{1}{v_2}$

(3) $\frac{v}{2}=\frac{v_1+v_2}{2}$ (4) $v=\sqrt{v_1v_2}$

NEET(UG) 2020

43. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is :

(g = 10 m/s²)

(1) 300 m (2) 360 m

(3) 340 m (4) 320 m

NEET(UG) 2020 (Covid-19)

44. A person sitting in the ground floor of a building notices through the window, of height 1.5 m, a ball dropped from the roof of the building crosses the window in 0.1 s. What is the velocity of the ball when it is at the topmost point of the window ?

(g = 10 m/s²)

(1) 15.5 m/s (2) 14.5 m/s

(3) 4.5 m/s (4) 20 m/s

NEET(UG) 2021

45. A small block slides down on a smooth inclined plane, starting from rest at time t = 0. Let S_n be the distance travelled by the block in the interval t = n – 1 to t = n. Then, the ratio $\frac{S_n}{S_{n+1}}$ is :

(1) $\frac{2n-1}{2n}$ (2) $\frac{2n-1}{2n+1}$ (3) $\frac{2n+1}{2n-1}$ (4) $\frac{2n}{2n-1}$

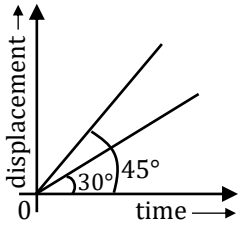
TG: @Chalnaayaaar

46. A car starts from rest and accelerates at 5 m/s². At t = 4 s, a ball is dropped out of a window by a person sitting in the car. What is the velocity and acceleration of the ball at t = 6 s ? (Take g = 10 m/s²)
(1) 20 m/s, 5 m/s² (2) 20 m/s, 0
(3) $20\sqrt{2}$ m/s, 0 (4) $20\sqrt{2}$ m/s, 10 m/s²

47. A particle moving in a circle of radius R with a uniform speed takes a time T to complete one revolution.
If this particle were projected with the same speed at an angle 'θ' to the horizontal, the maximum height attained by it equals 4R. The angle of projection, θ, is then given by :
(1) $\theta = \cos^{-1}\left(\frac{gT^2}{\pi^2 R}\right)^{1/2}$ (2) $\theta = \cos^{-1}\left(\frac{\pi^2 R}{gT^2}\right)^{1/2}$
(3) $\theta = \sin^{-1}\left(\frac{\pi^2 R}{gT^2}\right)^{1/2}$ (4) $\theta = \sin^{-1}\left(\frac{2gT^2}{\pi^2 R}\right)^{1/2}$

NEET(UG) 2022

48. The displacement-time graphs of two moving particles make angles of 30° and 45° with the x-axis as shown in the figure. The ratio of their respective velocity is :



(1) 1 : 1 (2) 1 : 2 (3) 1 : $\sqrt{3}$ (4) $\sqrt{3}$: 1

49. The ratio of the distances travelled by a freely falling body in the 1st, 2nd, 3rd and 4th second :
(1) 1 : 4 : 9 : 16 (2) 1 : 3 : 5 : 7
(3) 1 : 1 : 1 : 1 (4) 1 : 2 : 3 : 4

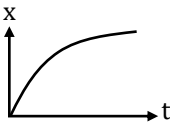
50. A ball is projected with a velocity, 10 ms⁻¹, at an angle of 60° with the vertical direction. Its speed at the highest point of its trajectory will be:
(1) $5\sqrt{3}$ ms⁻¹ (2) 5 ms⁻¹
(3) 10 ms⁻¹ (4) Zero

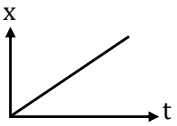
RE-NEET(UG) 2022

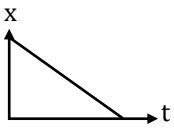
51. A cricket ball is thrown by a player at a speed of 20 m/s in a direction 30° above the horizontal. The maximum height attained by the ball during its motion is : (g = 10 m/s²)
(1) 5 m (2) 10 m (3) 20 m (4) 25 m

52. he position-time (x – t) graph for positive acceleration is :

(1)

(2) 

(3) 

(4) 

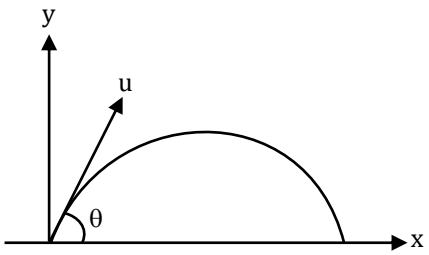
EXERCISE-II (Previous Year Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	2	4	4	1	2	1	3	1	2	4	1	3	2	2	2
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	3	4	2	4	1	3	3	2	4	4	4	3	4	1	4
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	1	1	2	3	2	2	2	1	3	4	1	2	1	2	2
Question	46	47	48	49	50	51	52								
Answer	4	4	3	2	1	1	1								

TG: @Chalnaayaaar

Exercise – III (Analytical Questions) Master Your Understanding

1. For ground to ground projectile motion with initial velocity u at angle θ from horizontal.



(A)	Change in speed from initial to final point	(i)	u – ucosθ
(B)	Magnitude of change in velocity from initial to final point	(ii)	usinθ
(C)	Change in speed from initial to top	(iii)	2usinθ
(D)	Magnitude of change in velocity from initial to top	(iv)	zero

Options :-

(1) (A)–(i), (B)–(ii), (C)–(iii), (D)–(iv)
(2) (A)–(iv), (B)–(ii), (C)–(i), (D)–(iii)
(3) (A)–(iv), (B)–(iii), (C)–(i), (D)–(ii)
(4) (A)–(iv), (B)–(iii), (C)–(ii), (D)–(i)

2. For initial velocity $(\vec{v}_i)=3\hat{i}-4\hat{j}$ and final velocity $(\vec{v}_f)=3\hat{i}+4\hat{j}$:-

(A)	$\lvert\Delta\vec{v}\rvert$	(i)	$8\hat{j}$
(B)	$\Delta\lvert\vec{v}\rvert$	(ii)	$6\hat{i}$
(C)	$\vec{v}_f-\vec{v}_i$	(iii)	0
(D)	$\vec{v}_f+\vec{v}_i$	(iv)	8

(1) (A)–(iii), (B)–(iv), (C)–(ii), (D)–(i)
(2) (A)–(iii), (B)–(iv), (C)–(i), (D)–(ii)
(3) (A)–(iv), (B)–(iii), (C)–(ii), (D)–(i)
(4) (A)–(iv), (B)–(iii), (C)–(i), (D)–(ii)

3. A particle is projected vertically upward from ground with initial velocity u such that it clears the top of a pole of height h after time t_1 in its path. It takes further time t_2 to reach the ground.

(A)	u	(i)	$\frac{(t_1+t_2)^2}{8}g$
(B)	h	(ii)	(t_1+t_2)
(C)	Time of flight	(iii)	$\frac{1}{2}g(t_1+t_2)$
(D)	Maximum height	(iv)	$\frac{1}{2}gt_1t_2$

(1) (A)–(ii), (B)–(i), (C)–(iii), (D)–(iv)
(2) (A)–(i), (B)–(ii), (C)–(iii), (D)–(iv)
(3) (A)–(iii), (B)–(iv), (C)–(ii), (D)–(i)
(4) (A)–(iv), (B)–(iii), (C)–(ii), (D)–(i)

4. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : The distance between two floating objects on a river flowing uniformly does not change with time.

Reason (R) : The floating object has the same velocity as that of the river.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

5. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : Horizontal component of velocity is constant in projectile motion under gravity.

Reason (R) : Two projectiles having same horizontal range must have the same time of flight.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

TG: @Chalnaayaaar

6. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : A particle with constant acceleration always moves along a straight line.

Reason (R) : A particle with constant acceleration will not change direction of motion.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.

(3) **(A)** is true but **(R)** is false.

(4) Both **(A)** and **(R)** are false.

7. An object may have-

(A) varying speed without having varying velocity

(B) varying velocity without having varying speed

(C) non-zero acceleration without having varying velocity

(D) non-zero acceleration without having varying speed

(1) Only B is correct

(2) Only D is correct

(3) Both B and D are correct

(4) All are correct

8. The velocity of a particle is zero at t = 0, then -

(A) the acceleration at t = 0 must be zero

(B) the acceleration at t = 0 may be zero

(C) if the acceleration is zero from t = 0 to t = 10 s, speed is also zero in this interval

(D) if the speed is zero from t = 0 to t = 10 sec, the acceleration is also zero in the interval

(1) (A), (C) and (D) are correct

(2) (B), (C) and (D) are correct

(3) (A) and (D) are correct

(4) (B) and (C) are correct

9. Consider the motion of the tip of the minute hand of a clock for one hour motion which of the following is/are correct.

(A) the displacement is zero

(B) the distance covered is zero

(C) the average speed is zero

(D) the average velocity is zero

Option

(1) (A) & (D) (2) (B) & (C)

(3) (A) & (C) (4) (B) & (D)

10. Instantaneous velocity of a particle -

(A) depends on instantaneous position

(B) depends on instantaneous speed

(C) independent of instantaneous position

(D) independent of instantaneous speed

(1) Btoth (A) & (B) are correct

(2) Both (C) & (D) are correct

(3) Both (A) & (D) are correct

(4) Both (B) & (C) are correct

11. For a body moving on a straight line if x is position coordínate and t is time then acceleration of body is constant when -

(A) x and velocity is linear

(B) x and square of velocity is linear

(C) t and velocity is linear

(D) t and square of velocity is linear.

(1) Both (A) & (B) are correct

(2) Both (C) & (D) are correct

(3) Both (A) & (D) are correct

(4) Both (B) & (C) are correct

12. If the velocity of a body is constant -

(A) |Velocity| = speed

(B) |Average velocity| = speed

(C) Velocity = average velocity

(D) Speed = average speed

(1) Only (A) is correct

(2) (A) and (B) are correct

(3) (C) and (D) are correct

(4) All are correct

13. A particle can move only along x-axis. Three pairs of initial and final positions of particle at two successive times are given

Pair	Initial position	Final position
1	– 3m	+ 5m
2	– 3m	– 7m
3	+ 7m	– 3m

Find the sum of magnitudes of displacement in the pairs which give negative displacement in m.

(1) 14 (2) 12

(3) 20 (4) 22

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14. In first and second columns of the following table, unit vectors $\hat{a}$ and $\hat{b}$ of some geographical directions are mentioned. Complete the third column.

	Unit vector $\hat{a}$	Unit Vector $\hat{b}$	Scalar Product $\hat{a}\cdot\hat{b}$
A	West	Up	.....
B	South	East	.....
C	30° North of west	Down	.....
D	30° Down of south	Up	.....

Options :-

(1) $A \to 0, B \to 0, C \to 0, D \to -\frac{1}{2}$

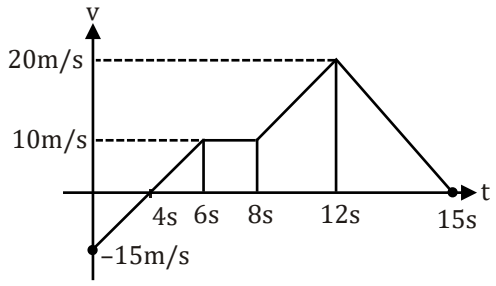
(2) $A \to 0, B \to 0, C \to \frac{1}{2}, D \to -\frac{1}{2}$

(3) $A \to 1, B \to 1, C \to \frac{1}{2}, D \to \frac{1}{2}$

(4) $A \to 1, B \to 1, C \to -\frac{1}{2}, D \to \frac{1}{2}$

Paragraph for Question Nos. 15 to 17

A moving particle is acted upon by three forces at different times to bring it to rest. Its velocity versus time graph is given below



15. The average speed for the first 6 s is

(1) zero (2) $\frac{5}{3}$ ms^{-1}

(3) $\frac{10}{3}$ ms^{-1} (4) $\frac{20}{3}$ ms^{-1}

16. The average velocity for the first 12s is

(1) zero (2) 5 m/s

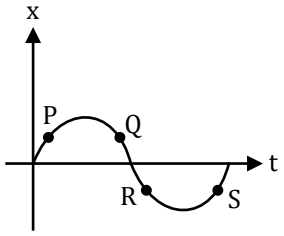
(3) $\frac{10}{3}$ m/s (4) 10 m/s

17. The average acceleration from t=5s to t=15s is

(1) zero (2) –0.5 m/s^2

(3) +0.5 m/s^2 (4) 1 m/s^2

18. A car is moving along a straight line. It's displacement (x) - time(t) graph is shown in column II. Match the entries in column I with points on graph.



Column I	Column II
(A) x → negative, v → positive, a → positive	(P) P
(B) x → positive, v → negative, a→ negative	(Q) Q
(C) x → negative, v → negative, a→ positive	(R) R
(D) x → positive, v → positive, a → negative	(S) S

Options :-

(1) A → S, B → Q, C → R, D → P

(2) A → P, B → R, C → Q, D → S

(3) A → S, B → R, C → Q, D → P

(4) A → S, B → Q, C → R, D → S

EXERCISE-III (Analytical Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	3	4	3	1	3	4	3	2	1	4	4	4	1	1	4
Question	16	17	18												
Answer	2	2	1												

Important Notes

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